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Frank E. Rom: The Nuclear Powered Airplane  
Abraham J. Siegel: Unions, Employers, and the Computer  
Sir Peter Medawar: On "The Effecting of All Things Possible"  
Albert H. Teich: International Laboratories



# Technology Review

**Koichi Masubuchi:**  
**Welding in Modern Industry**



# technology review

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### The First Line

To the reader of this magazine whose connection with the Massachusetts Institute of Technology is through *Technology Review* alone, the events of the week of November 3 (see "Special Report," pages 96A through 96J) may seem of peripheral importance. Yet they hold lessons—and raise questions—which go far beyond the Institute.

Whether the Court order granted to M.I.T.'s President prevented major violence at the Institute during that week will never be known. But it is clear that the prodigious efforts at communication which were initiated by the M.I.T. administration, literally without precedent at the Institute, went far to maintain the community's strength and confidence. Continuous and effective consultation with Cambridge police and city officials surely helped to prevent violence of another kind.

In a crisis the best public relations is candor. M.I.T.'s efforts to make every

confirmable fact available to the community and the 140 newspapermen who were assigned to the campus helped to make clear the course of events.

President Howard W. Johnson drew a firm line between the right to dissent, which has place on every campus, and violent disruption, which has no place, though the distinction is sometimes difficult.

Faculty, too, carry major responsibility, and their support is imperative for a fabric of community trust. A known lesson of campus disruptions, for example, is that violence is minimized if a significant number of faculty are on hand.

The M.I.T. faculty is a commuting one, so close student-faculty contacts are not easy. But the faculty has made efforts to overcome this handicap, and the relationship of faculty and students was further strengthened by the events of November 4, 5, and 6. President Johnson has called the faculty's common sense "uncommon" during the events of and preceding those days. Special faculty and student groups were in close consultation; several faculty were on duty literally around the clock. The majority, resolving that the best response to the crisis was to conduct "business as usual," kept classes and laboratories functioning in every sense normally. But these were—thankfully—not normal times, and one may ask if more faculty presence on the streets and in the corridors might have served to lessen tension.

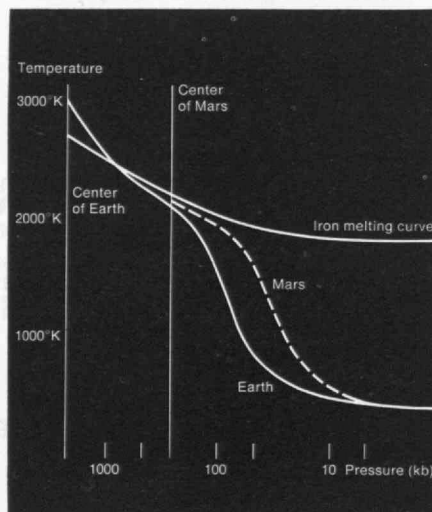
What of the future? The faculty determines an institution's greatness, but they may also be its Achilles heel. Ill equipped by organization or tradition to cope with issues such as these, the M.I.T. faculty must now consider three very special questions: how to debate and legislate upon the basic problems of policy which confront the Institute; how to discipline those students whose actions on November 4, 5, and 6 clearly jeopardized the fundamental rights on which a university is built; and how to define the limits of academic freedom in the cases of those faculty members who during those days may have abused their rights and privileges.—D.S., J.M.

### Next Month

*Technology Review* for January will include a unique proposal to internationalize outer space by Craig R. Eisendrath, a former member of the U.S. Foreign Service; a report on sulfur pollution of the atmosphere by Thomas K. Sherwood, Emeritus Professor of Chemical Engineering; and a new challenge to creative technology proposed by Philip Abelson, Editor of *Science*.

### A Correction

Perceptive readers will have discovered that—through a remarkable chain of office errors and misassumptions—a key illustration supportive of his hypothesis about the creation of the planetary system was omitted from Professor Don L. Anderson's article in the October/November *Review*. The illustration is printed below; its point is to demonstrate that under one particular set of assumptions the temperatures associated with planetary formation are high enough to give Earth the molten core we believe it has but not high enough to give Mars such a core—a fact which is consistent with observations of that planet. Professor Anderson's hypothesis is among the most interesting astrophysical proposals the *Review* has been privileged to publish, and if by omitting the illustration earlier and publishing it now we have won him new readers, the *Review's* original error was not in fact a complete misfortune.—J. M.





# Technology Review

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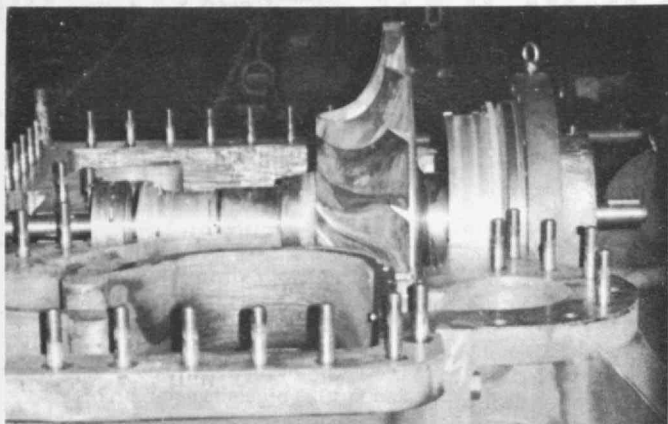
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## ■ PRODUCT DEVELOPMENT—TURBOMACHINERY



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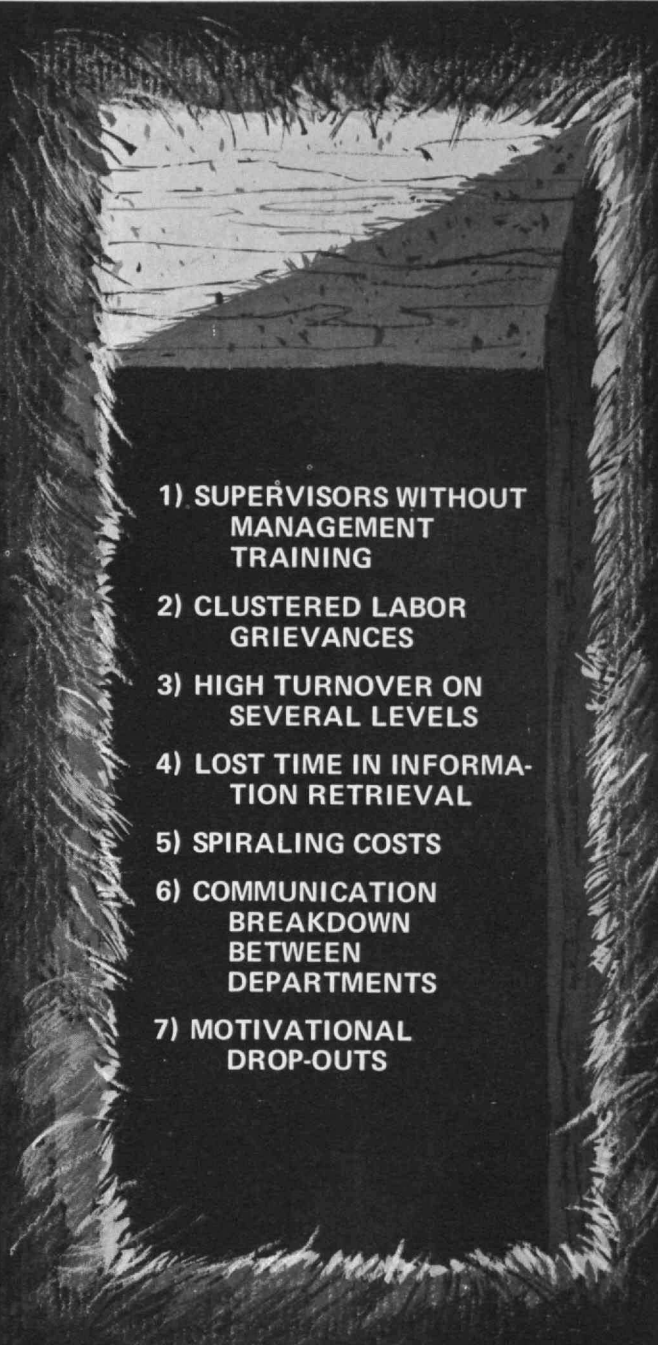
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# Technology's World: The Facts and the Feelings

Hobnobbing with some of the world's great thinkers can be unsettling enough for your preconceptions. It's downright unnerving when the notions of the superminds themselves begin to be punctured, in this case by sharpwitted students.

The thinkers—some 40 engineers, scientists, economists, and writers from 16 countries—flocked to Stockholm in September for a Nobel Foundation symposium with the fuzzy title "The Place of Value in a World of Facts." Freely translated, that means, "How can mankind cope with the rather frightening world that science and technology has thrust upon it?" At least, the thinkers tackled their confab from that angle.

A group of Swedish students had been invited to join them so there would be some point to discussing the "generation gap." Only the students didn't see their role that way. They found the personal commitments and motivations of the thinkers to be a more relevant subject.

For one thing, the concept of "generation gap" seemed vacuous. Differences in knowledge are "the most important reason for the value gap between generations," observed the students in one of several printed handouts. "But," they added, "differences in knowledge also exist between people from the same generation. Consequently we find the same value gap among adults as we usually find between parents and children . . ."

"Age is not the important thing," observed Jan Fjellander, a spokesman for the young people. "To speak of an age 'confrontation' is rather irrelevant."

So, when distinguished ethologist Konrad Lorenz publicly pleaded with youth not to "hate us, for we cannot hate our children," the students seemed more perplexed than hateful. When famed anthropologist Margaret Mead spoke of elders learning from the young, the students wondered openly why the distinguished elders hadn't learned more from what they, themselves, preach.

These elders, for example, listened sympathetically as Harrison Brown of the California Institute of Technology once again went through the exercise of out-

lining the rich-poor gap that divides the nations. "Perhaps the greatest tragedy of the human experience is that our understanding of man and his behavior has not kept pace with our knowledge of how to control nature," he said. "We have now reached the point where from a technological point of view starvation and misery in the world are inexcusable."

The elders listened, as they have many times before, and shared Dr. Brown's sense of tragedy. But the students wondered why, if scientists know such things, more of them aren't trying to do something about it personally? Why, one of them asked publically, don't they put aside such frivolities as space research and heart transplants and work to banish hunger and misery?

Again, symposium members outlined the potential horrors of nuclear or biological warfare. And again other members joined in the familiar ritual of decrying war's dangers. To which the students responded by asking why did some of them work on military projects, if they know all that?

"Too many things have been dealt with in an abstract way," the students complained in one of two "bullet-ins" they issued. It was a "bullet-in" because the masthead showed a bullet smashing a plaque labeled "dead and stable value systems and behavior."

"Should not we prepare statements on important problems. . . ?," they asked. "The first step would be to find out how many of the participants take part in armament and war industries and let them present their case."

Neither those students nor the generation they represented needed telling how much the world has changed since World War II. Indeed, for them the world hasn't changed at all. They've never known a world not colored by the threat of nuclear war. They've never known a world in which poverty and misery for some were "inevitable" rather than being a blight that men could eliminate given a concerted world effort.

This is a different order of awareness than the scholarly knowledge of the sym-

posium members. Margaret Mead caught this difference when she pointed out that no adults on this planet today have had the experience of those who have grown up in the last twenty years. And adults who have experienced the vast world changes of the past fifty years have an experience the young can't share.

This is lonely, she said, lonely for both groups. Those who have lived through the past fifty years haven't assimilated what went on well enough to communicate clearly with the young. Likewise, if you've grown up in a world where war could mean the annihilation of humanity, you can't read yourself back into the position of those who fought Hitler, those who could fight a war without endangering mankind. Even if worldwide arms control destroyed all nuclear arsenals, the capacity to make the bomb would remain, Dr. Mead observed. This the young know in a common-sense, almost instinctive way. This is why they want to strike at the root causes that divide the world and generate tensions tending toward war—causes such as arms races, the rich-poor gap, chauvinism.

Symposium members took up these themes, especially the attitudes that nudge men toward war. Edinburgh University geneticist C. H. Waddington noted that one of the great faults with the systems of values with which men now deal with the world is "our lack of readiness to change, and change in ways that take account of other people's values. This is an old value that has been buried under other values, such as 'material progress'." He added that men "need to break down this overriding belief in the absolute validity of particular notions of right and wrong."

Writer and historian of science Arthur Koestler took up this theme to point out how irrational the causes of war have often been. He explained that "the rule is that the man who goes to war . . . fights for imperatives which are not territorial but mostly symbolic or abstract: the 'true' religion, the 'righteous' cause, the 'correct' political system. The fanatic is prepared to lay down his life for the object of his worship . . . He is, alas, also prepared to kill anybody who represents a supposed threat to his idol." He con-

*Its pacific and picturesque surroundings contrasted with some of the content at this fall's Nobel Foundation symposium on "The Place of Value in a World of Facts" in Stockholm. A Swedish student, having asked some of the delegates why they came, chided them with a set of rhetorical questions: "Do they come here to help the world? Or do they come because they . . . like to go to meetings to eat the good food and talk with their friends, saying the same things over and over again?" (Photo: H. Armstrong Roberts)*

cluded from this that "the predicament of man is not caused by the aggressivity of the individual, but . . . by man's irresistible urge to identify with the group and espouse its beliefs enthusiastically and uncritically. He is . . . susceptible to being imprinted with slogans and symbols . . . Thus one of the main pathogenic factors is hyperdependence combined with suggestibility."

Dr. Jerome S. Bruner, director of the Center for Cognitive Studies, Harvard University, backed up this conclusion by pointing out that the human brain has a limited input capacity. The nervous system, he explained, depends on rough and ready techniques for handling a multiplicity of stimuli. It has evolved ways to put these into a context that is easy to hold on to. This tendency shows up in many ways, such as traditional forms, abstractions, and preconceptions. People pay a price for this. The abstractions are hard to give up. They can lock people into particular views of themselves and the world.

Excessive nationalism, now rampant in the world, is one such locked-in viewpoint with which symposium members were especially concerned. In fact, they felt so strongly about its dangers that the symposium's reporting group emphasized it in the meeting's summary document.

" . . . One of the greatest threats to human survival," the report said, "is the supremacy of the national ideal at a time when advances in transport and communications have unified the world in a practical sense. Nationalism maintains unnecessary inequality and conflict in the world, and also the weapons systems which threaten catastrophe. It is sustained by the excessive indoctrinability, group loyalty, and ethnocentric outlook of man." The report urged that, "for the sake of all our children, whether in rich or poor nations, the mutuality and interdependence of human life should be ever-present in our consciousness."

This is the kind of sentiment with which the students could, and did, identify. Yet they tempered their enthusiasm by wondering how wise these brilliant thinkers really are when it comes to marking out ways to put such an ideal into practice.



What is their individual, personal commitment?

"The discussions have been searching," Mr. Fjellander said. "But while these people have a background of knowledge that enables them more easily to identify value problems than can others without such knowledge, they are no better at discussing values than anyone else. . . . I don't think their generation has made adequate use of its knowledge, nor has mine."

"He treats me like his daughter," another student complained after chatting with U.S. Atomic Energy Commission Chairman Glenn Seaborg. "But," she added, "I ask these people why they come here. Do they come to help the world? Or do they come because they have a comfortable position and salary and they like to go to meetings to eat the good food and talk with their friends, saying the same things over and over again?"

"Being a guest of the Nobel Foundation seems to be very impressive to people over 35," chided one of the "bullet-ins."

Symposium members took such criticism patiently. They strove to keep up the dialogue with what they obviously regarded as representatives of the generation upon whom the world problems they foresee will bear most heavily. In fact, both sides seemed to feel it was important to keep the dialogue going, important for the generations to learn to work together.

Margaret Mead sensed this undercurrent of thought, which had a tint of anxiety. It will take the full spectrum of humanity to

build the future, she said, recalling a remark made by a student over the symposium public address system. "The water is rising, I have no tools for building boats," the anonymous voice had said. "The young may not have the tools," she declared, "but we have."

Many observers found the symposium windy, repetitive, and inconclusive. They thought the young people naive and rather tame compared to the militants of Paris, Tokyo, or Berkeley. This is fair criticism. Yet, unfocused as the symposium may have been, it embodied a rather basic confrontation. Intellectual knowledge of technology's challenge faced the emotional awareness of a generation that feels that challenge in its guts. I found that confrontation awesome.



Robert C. Cowen, Science Editor of the *Christian Science Monitor*, is a Past President of the National Association of Science writers; he is writing from the Monitor's London office in 1969-70.

"Fiscal 1970 will certainly be the worst of four straight years in which research and education funds have either been held level or cut . . . Are scientists willing to leave their laboratories to tell the country this story?"

# Who Needs Science? See Your Congressman

American science today faces its toughest job in the last 25 years: persuading America to support science.

Scientists, unless they like half-rations, must also persuade themselves to try. Scientists and educators for science, with the exception of a few tougher minds, have not really faced the facts that:

◇ For four years science and graduate education have been taking an annual pole-axing from Congress, to the vast indifference of American men, women, and children.

◇ The pole-axing shows no signs of being temporary, as so many scientists have patiently hoped. All the portents for fiscal 1971 (July 1, 1970, to June 30, 1971), according to reports now being quietly shuffled in Washington, are equally bad.

Fiscal 1970, the financial year that supposedly began July 1 if Congress had appropriated any money, is plainly a disaster.

For nearly 25 years support for science was no problem. Great events did the job. First science's exhilarating World War II affair with the atom, plus radar, sonar, electronics. Clearly this new national servant, the scientist, was to be supported.

Then came the drive for the H-bomb and another wave of promise: more weaponry and, on the horizon, fusion power. A few years later came Sputnik. There was little need but to say, "I'm a scientist," and the public would pay.

## The Sound of Victory or Smell of Pollution?

More than 10 years have passed. We Americans have surpassed Sputnik and Luna. Few Americans and few Congressmen are worried about being technologically overtaken. And the unremembering young have emerged. Big Science is now credited with producing death, not hope or survival. The promises of technological progress are overpowered by the smell of pollution. Many in effect ask: "Who needs science?"

At the same time—in this center of national power—the scientist has run short

of power. Congress no longer listens in awe to a Lawrence or Oppenheimer. The unquestioning friends of medical science—Senator Hill, Representative Fogarty—have passed from the scene. The few men in Congress who would speak for science have not yet succeeded in becoming brokers of power. About the only branch of technology that wins votes is space. Even the atomic energy boys have become black hats.

Add Vietnam and inflation, and fiscal 1970 will certainly be the worst of four straight years in which research and education funds have either been held level or cut. The figures are not yet in—Congress's delay in passing appropriations is "probably the worst in history," says Minority Leader Gerald Ford—but "it is very clear," Presidential Science Adviser Dr. Lee DuBridge reports, "that painful cuts will be imposed."

Or their equivalent. The Nixon budget asked \$500 million for the National Science Foundation, nearly a fourth of the government's \$2.1 billion support of academic science and training. It is being futilely pressed by researchers to move into basic areas being abandoned by the Defense Department, under fire from both budget-cutters and social critics.

A House Appropriations Subcommittee cut the Nixon \$500 million to \$420 million (the 1969 figure); left-over funds might add \$20 million; the Senate might add more. Even if N.S.F. winds up with \$450 million, this will mean just a 6 per cent increase. Inflation, increasing sophistication (more expensive equipment) and increasing salaries each eat 5 per cent a year, N.S.F.'s new director, Dr. William D. McElroy, calculates.

So N.S.F. and other science agencies, by this reasoning, need about 15 per cent more a year to stay even. Whether the figure should be 15 per cent or something less, whether or not some projects have been a little gilded, whether or not some fat can be trimmed from the academic corpus—these matters become academic after four straight years of cuts, hold-backs or minimal increases.

In health and biomedical areas, the Nixon budget allotted the National Institutes of

Health \$1.64 billion compared to last year's \$1.93 billion for clinical projects, research and training. All September 1 grant renewals were cut 5 per cent; funds for new grants were cut 10 per cent on the average, and cuts as the year progresses will probably go deeper.

There will probably be fewer than 10,000 N.I.H. grants in effect by the end of fiscal 1970, compared with 12,324 in 1965. Nineteen of 93 four-to-10-bed "clinical research" units in hospitals are to be abandoned. Five programs to attack chronic diseases (heart disease, stroke, cancer, arthritis, diabetes, neurologic and sensory diseases and respiratory disease) are to be phased out.

Nine medical schools, reports Dr. John Cooper of the Association of American Medical Colleges, are "teetering on the edge of insolvency." Medical schools today get upwards of 40 per cent of all their funds (and sometimes 50, 60 or even 70 per cent) from federal research and training grants.

Simultaneous cuts in Medicaid funds (that pay for many teaching patients), the draft, cuts in scholarship and loan funds, and apparently impending cuts in gifts and foundation grants—by simultaneous Congressional action—all promise catastrophe.

## A Possibility of Collapse

DuBridge believes: "The nation will pay a heavy price . . . Our scientific corps is not growing as it needs to grow—when our population is increasing, and the needs of the country are so clear and glaring."

Dr. Cooper: "The areas affected in medicine are really part of the training of future faculty—the very people needed to produce the health manpower to meet the crisis President Nixon says will exist."

Dr. Philip Handler of the National Academy of Sciences: "A crisis is facing all American science. . . . It is a very black picture."

McElroy: "I think we're on the edge. The way things are going, I see a real possibility of collapse"—meaning not just failure to buy new buildings or new telescopes, things already happening, but



National Science Foundation figures reveal the downward trend in federal obligations for basic research, applied research, and development. Between 1956 and 1964 the averaged annual growth rate in federal support for basic research was 29 per cent; for applied research and for development, 21 per cent. Since 1964 the growth rates have been 9, 5, and 3 per cent, respectively.

loss of young people who are "already being forced to turn to other fields" and then loss of faculties, "which has not happened but will begin."

The country will need new armies of experts not just for health and defense—man has not abolished war—but also to attack pollution, man universities, and build new urban and industrial technologies. Present federal policies will not provide them. Total research and training, in terms of real effort, could soon be down 40 per cent since fiscal 1967 (precise estimates are not available; such figures usually run two years late).

Just one example. A University of California zoology professor wrote *Time* magazine how he and a colleague trying to learn how to manage our polluted environment "have spent between them about 40 man-hours negotiating with a major U.S. agency for a joint program to train one graduate student. The request to date has not been answered. You cannot imagine the bitterness I feel at the absurd discrepancy between the demands made on our time by the press and by politicians, which contrast so sharply with our inability to get funds."

#### How Do You Affect Representative Soandso?

What to do? In the American system there is no answer but: (1) Get together the facts; (2) Holler. In the September 26 issue of *Science* Dr. Philip Abelson, Editor, called on scientists for "political action." "They have the wit and energy to develop the political clout necessary, and they should get about that business."

A "waste of time" to see your Congressman? Ridiculous. Power in Washington is based on having a constituent or electorate behind you, having votes. Ralph Nader has shown that even one voice can attract such power by persistent and intelligent protest.

Young, concerned scientists, joined together in small groups in many communities, played a huge role in starting America's present concern with the environment. Now the environment, the nation's health, the job market, the country's balance of payments, continuing military obligations—all demand produc-

tion of scientists and technologists.

One important man in Washington science recently expressed some despair about speaking out. "How do you affect Representative Soandso?" he asked, naming a particularly unresponsive Congressman in a key spot.

But Dr. McElroy, new to his job, has violated tradition by personally calling on 25 senators and representatives, "and I ask them, Why don't they want to support the development of science and technology, and the exploration needed to keep young people, which are the future of America?"

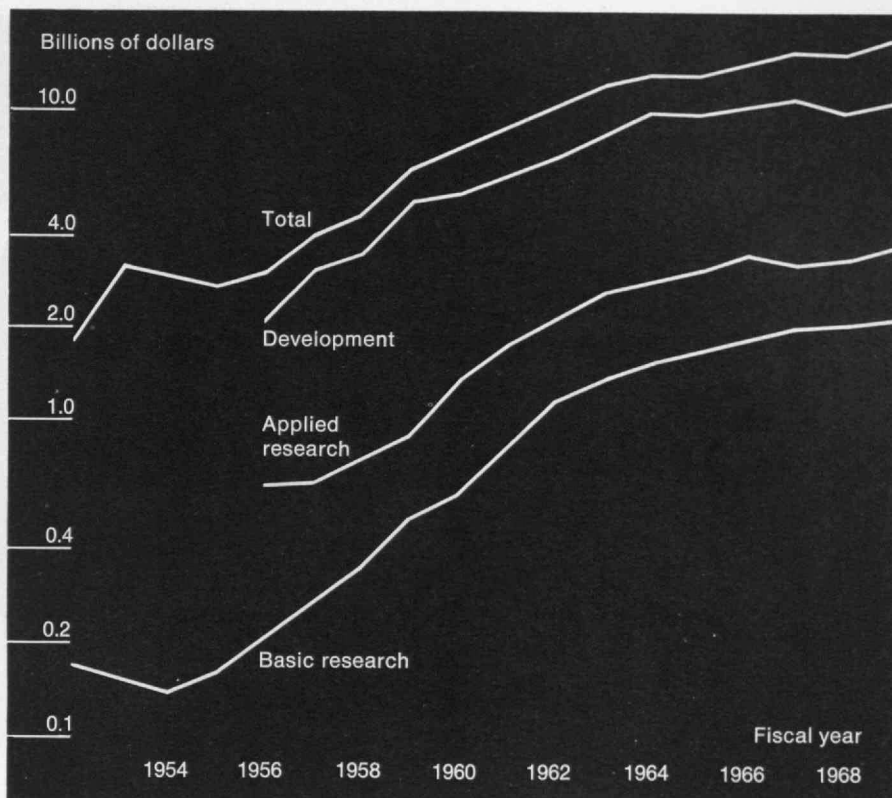
McElroy cannot turn the tide rapidly. He cannot turn it alone. But so far, he says, he has not had very much help. Either he will be joined in this kind of effort and button-holing or else—

Or else what? The U.S. today seems se-

curely in the lead as the preeminent world power in science. But so have other nations in the past—Germany, Britain, France, even Holland—and they probably passed their peak and started downhill long before they were aware of it. Are scientists willing to leave their laboratories to tell the country this story?



Victor Cohn is Science Editor of the Washington Post; he formerly held a similar position with the Minneapolis Tribune.



"What was lacking under de Gaulle—who was for research in the gross but who paid little attention to the details—was the political determination to deal with one of the most difficult problems in research administration: the longevity of research centers that are no longer serving a useful purpose."

# De Gaulle, Research, and the Balance of Payments

Policymaking for French science and technology is currently descending from a 10-year Gaullist high—and henceforth the key words are supposed to be profit and utility, rather than grandeur and independence.

Normally, such a turnabout takes some time to manifest itself; such has been the case in Britain, which is still awaiting the "white-hot technological revolution" that Harold Wilson promised some five years back. But France has certain advantages in this business—namely, a desperate need to realize greater benefits from its considerable investment in research and development and a highly centralized system of administration that offers far more potential for control than does the casual feudalism that prevails among British science, education, and industry.

## Matching French Research to French Needs

The de Gaulle years, as it turns out, were not bad ones for many fields of science and technology. Expenditures rocketed, fine research facilities were constructed, and thousands of scientists, engineers, and technicians were trained. But by any standard, except that of prestige, the resulting enterprise was poorly matched to the needs of French society.

For example, because of their prestige value, space and nuclear research were force-fed. In the case of the latter, the desire for independence from the United States's domination of enriched uranium production led France to back what has turned out to be a losing line of natural uranium reactors. On the other hand, biomedical research, which carries no realpolitik value, was given some increase in support, but no great surge was forthcoming. Thus in recent years health-related research has received an annual appropriation of approximately \$15 million; space research has received as much as \$55 million. (The proportions are similar to those in the U.S. federal budget, but, besides the element of critical mass, there is also the fact that local and philanthropic funds play an important role in U.S. research whereas they are virtually non-existent in France.)

The French atomic energy agency, charged primarily with building a nuclear arsenal, swelled to a staff of 31,000 during the de Gaulle regime, and it has stood at this level, with minor fluctuations, for several years, despite the fact that many of its facilities are occupied with make-work assignments, and, according to some critics, there are instances where even these diversions are lacking.

But perhaps most grating for the country that made a bestseller of "the American challenge" is that the Gaullist research boom had little or no impact on French industry. While admiration abounded for the American model of close interplay between academic science and industry, the rigidities of French institutions were such that, with few exceptions—such as the deliberate meshing of science and industry around the University of Grenoble—the two sectors managed to preserve their ancient aloofness.

## Merging Science and Industry

It is still too early to determine whether a significant realignment can be worked out. But with the recently elected Pompidou government now settling into office, there are several tangible signs of a determination to put France's considerable scientific and technical talents to work for the benefit of the country rather than for the prestige of the government.

One of the new government's first steps was to merge the Ministry of Science and the Ministry of Industry into a single organization, to be known as the Ministry for Industrial and Scientific Development. The merger gives to a single agency responsibilities that encompass atomic energy, space, oceanography, and industrial expansion. No doubt it will prove to be unwieldy, as Britain's Ministry of Technology—its closest counterpart—has proved to be a difficult institution to manage. But at this point in French scientific and industrial affairs, it is hard to visualize any effective alternative of a sort of superministry that will have sufficient power to break through the crustified forms that abound in France.

At the head of the new ministry was

placed one of the youthful wonders of French public administration, Francois-Xavier Ortoli, a 45-year-old economist (with a law degree from the University of Hanoi) who previously served as Minister of Finance, Minister of Education, and Minister of Public Works. He was also secretary to the cabinet and at one time headed the staff that prepares the five-year plan for development of the French economy.

## Scientific Research and the Balance of Payments

Science policy studies being well developed in France, there is no shortage of diagnoses and proposed remedies for the economic ailment to which research and its applications can be expected to provide some relief. What was lacking under de Gaulle—who was for research in the gross but who paid little attention to the details—was the political determination to deal with one of the most difficult problems in research administration: the longevity of research centers that are no longer serving a useful purpose.

High on the French list is the massive atomic energy establishment, which benefited both from de Gaulle's determination to boost atomic energy and from France's traditional unwillingness to throttle any institution that has survived infancy. Though long immune to cutbacks, atomic energy has now been singled out for massive shrinkage. Details are yet to come, but, at this writing, some reports have it that the civil side of atomic energy may have to absorb budget reductions on the order of 40 per cent. Under de Gaulle, the purchase of an American reactor system would have been out of the question, but apparently such is now in the works, as the new government candidly acknowledges that politically designed power reactors are not necessarily the most efficient.

The nuclear *force de frappe* has apparently been granted immunity from the austerity drive, as has the Concorde supersonic transport project. Both, of course, have progressed to the stage where even the most economy-minded politician would hesitate to order a halt, and, in the case of the Concorde, there is also the hope that it may defy all prophe-



General de Gaulle inspecting the Atomic Energy Research Center at Marcoule in 1958. The Pompidou government is now reassessing French commitments to basic research and to cooperative scientific ventures to bring expenditures more in line with current national priorities. (Photo: French Embassy Press and Information Division, New York)

cies and actually turn out to be something of a commercial success.

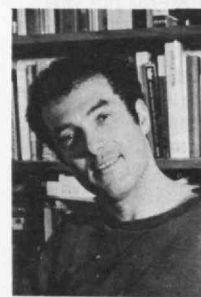
Space research, another one of de Gaulle's interests—complete with a costly and little-used equatorial launching site—is squarely in the sights of the budget cutters. The government has announced its intention to cut back substantially on its contributions to the European Space Research Organization. Ironically E.S.R.O., after a difficult beginning, has evolved into a smooth-running and highly competent institution for promoting European cooperation in space research. That it should become a victim of the French austerity movement is something of a misfortune for science; but in terms of the financial and economic strategy that the new government is following, the move makes at least short-range sense: E.S.R.O., which is dedicated to scientific research, produces only scientific knowledge, and scientific knowledge contributes nothing to the balance of payments.

In its new attitude toward research and

development, France is now treading on ground that was long ago crossed by Britain. It may be argued that the British have not yet mastered, or even come close to mastering, the difficult task of—to put it bluntly—turning scientific knowledge into money. But they have tried mightily, and along the way they have developed a capacity for attractive rhetoric on the subject of research policy.

France, in evolving its new policies, might, for example, consider the following, from a guest editorial in *Science Journal* by Anthony Wedgwood Benn, the British Minister of Science and Technology: "We have come to the end of those days when any project, sufficiently big and spectacular, could almost automatically expect to win approval and the funds it needed. The lobbyists for glamorous programs of scientific research will in the future have to prove their merit against the claims of others seeking to solve more mundane but more pressing problems. We are now trying to balance the real potential of pro-

gram against program, project against project, to ensure, for example, that urgent needs are not crowded out by programs based on national prestige. The era of technomania is passing. People are coming to see science and technology, not as a Roman circus for their casual diversion, but as an essential part of daily living. It is a healthy and welcome development."



Daniel S. Greenberg is stationed in London as Foreign Editor of *Science*.



The future exploration of the planets, said Astronaut Harrison Schmitt at the National Academy of Sciences this fall, will assure the nation "a continuing frontier" and spare the U.S. from the perils of "an introspective future."

# Will There Be Enough Science in Space?

The most significant debates about the future of the American space program over the next few years probably will not concern the size of its budget—which can be expected to hover near its present annual level of \$4 billion in 1969 money—but the relative weight to be assigned to further manned adventures in space and to exploration by unmanned, automated spacecraft.

This crucial issue was brought into focus during a debate October 14 at the autumn meeting of the National Academy of Sciences in Hanover, N.H., in which two astronauts, Frank Borman and Harrison Schmitt, appeared on the same panel with Anthony Turkevich of the University of Chicago, William Pickering of the Jet Propulsion Laboratory, and John Findlay of the National Radio Astronomy Observatory.

Although there were many signs of a convergence of views, the proponents of manned and unmanned space flights each acknowledging the crucial importance of the other and calling for a "balanced" program, there also were signs of anxiety. The scientists suggested that they would be short-changed in the 1970's as they felt they had been in the 1960's.

Dr. Findlay, who is the head of the Lunar and Planetary Missions Board of the U.S. space agency N.A.S.A., said that the program recently outlined by the agency to President Nixon's Space Task Group (with Vice President Spiro Agnew as Chairman and including Air Force Secretary Robert C. Seamans Jr., N.A.S.A. Administrator Thomas O. Paine, and Presidential Science Adviser Lee A. DuBridge) is "not a bad program, but I do not believe it is a well-balanced program." He expressed the fear that scientific satellites and unmanned probes of the planets would suffer cuts in times of money shortage. "It will be the unmanned exploration that gets squeezed if funds get squeezed," he said.

The Space Task Group's report says that "a decision to phase out manned space flight operations, although painful, is the only way to achieve significant reductions in N.A.S.A. budget over the long term." It is clear that this option is not endorsed.

The report leaves to the President a decision about whether or when to commit the United States to a manned flight to Mars.

But the report also lists a large number of other goals which would be pursued anyway, whether or not manned space flight is retained. Among them: a space station in Earth orbit leading to a 50-man and then a 100-man space base (using more and more of a common type of module); a chemical, two-stage space shuttle to carry people and materials back and forth from Earth to orbit; a lunar orbiting station to be supplied by a nuclear space-tug moving back and forth from Earth orbit to lunar orbit; and a lunar surface base.

The Space Task Group also specifically endorsed the three-planet tours of the outer planets recommended by the Space Science Board of the National Academy of Sciences.

N.A.S.A.'s plans for the exploration of the moon, which include a swift series of Apollo lunar landings—eight of them after Apollo 12 stretching into 1973 to be followed by a lunar-orbit space station and a lunar surface base as early as the late 1970's—also drew Dr. Findlay's criticism for insufficient attention to the role unmanned craft could play. He urged that N.A.S.A. plan for more unmanned Lunar Orbiters and Surveyors of the sort which paved the way for the Apollo 11 landing.

After the "fantastic success" of Apollo 11, said Dr. Findlay, "the prime purpose of going to the moon must be scientific," indicating that calculations of scientific return should govern such things as the interval between manned flights and whether an unmanned or a manned craft does a particular mission.

## The Power of Unmanned Experiments

Dr. Turkevich, who was the principal scientist on the alpha back-scatter chemical composition probes flown on unmanned Surveyors V and VII, said it is clear that sophisticated chemical and seismic instruments can be landed by automated craft on planets like Mars.

To be sure, Dr. Turkevich acknowledged, an automated spacecraft is no better than

what is built into it (and the skill of the controllers left behind on Earth), "but you can build a good deal in to meet unforeseen situations."

There was an incident on Surveyor VII, which landed near the lip of the fresh, huge crater Tycho, which illustrates this, Dr. Turkevich said. The string which was to lower the "little gold box" containing the alpha back-scatter experiment to the lunar surface became stuck. And so the mechanical arm of a "scooper" on Surveyor VII was used to push the experiment down to the surface, where it had to sit to detect the chemical "signatures" of the atoms—their re-radiation in response to the bombardment of alpha particles from the little gold box.

Remote control technology has hardly been scratched, said Dr. Turkevich, following up comments of Dr. Pickering that the multi-year outer-planet probes planned for the late 1970's would require "considerable ingenuity packed into the spacecraft itself." In other words, a great deal of computer capacity must be carried along to detect problems on board and direct some kind of "self-repair," because controllers on Earth cannot react quickly enough to a fault on a probe which is near Neptune, hours away even at the speed of light.

Dr. Turkevich said that space planners "cannot exclude the possibility of bringing back samples unmanned from Mars and not exposing the astronauts to the hazards of a long journey."

## A Growing Role for Science

Schmitt, a scientist-astronaut whom Borman described as having an excellent chance to "step on the moon before too many months," went at the problem a different way. He said the goals of continued manned landings on the moon were to explore the early history of the moon and the solar system, to test systems for the future exploration of the planets, and to keep open "a continuing frontier" which would spare the United States from the perils of "an introspective future."

Saying that he felt the U.S. "will lead in manned exploration" of space, Schmitt said that manned missions near the earth

*Professor Gene Simmons, an M.I.T. geophysicist, has been appointed chief scientist, Manned Spacecraft Center, Houston, following the resignation of a number of NASA scientists including Dr. Wilmot N. Hess, director of science and applications. Dr. Simmons has been working with Houston for about four years, advising on the scientific aspects of Apollo, and the new one-day-a-week overall guidance task will perhaps double his former Apollo workload. His experience of how scientific research is fitted into the Apollo program has led him to the optimistic conclusion that, once the engineering and economic constraints are understood, "if a good case can be made for doing something, it gets done."*



and on the moon must keep in mind the requirements of future missions to Mars.

In a question period after the panel's speeches, Schmitt said that the current requirements of a lunar landing made it mandatory that both men on board be trained both as pilots and as scientific observers. "We are going both routes. Pilots are getting scientist training and scientists are getting training as pilots." Schmitt, a geologist, has been responsible for training many of his fellow astronauts headed for the moon. "This is the only way we can proceed at this time." The training of the astronauts for lunar landings will place more and more emphasis on the scientific aspects as these assume more importance. "The program will get progressively more exciting scientifically," Schmitt said.

He added that the performance of Neil Armstrong and Edwin Aldrin on the moon July 20 and 21 has shown that "test pilots turn out to be excellent field geologists."

Borman said that unmanned missions contributed "vitality" to the success of manned missions "even though they lack romantic and public relations aspects."

Because of the claims of social programs, Borman said, "in the next 10 years funds will be scarce and rightly so. We must assure that the unmanned program not be a

poor relation. Our program must be balanced."

The best hope for getting many scientists into space, however, will be the 50-to-100-man space stations the U.S. plans to be putting together after 1975, Borman said. Then scientists in their 50's and 60's, lacking experience as pilots, will be able to go into space aboard the two-stage chemical "shuttles" now being intensively studied within N.A.S.A. and by contractors.

In a press conference following the debate, Schmitt was asked if he agreed with N.A.S.A.'s present plans to have a lunar landing every four or five months. Looking at the issue from the strictly scientific viewpoint, said Schmitt, landings should occur every eight to 12 months so that the findings of each landing could significantly affect the planning for the next one.

"But you can't view one item by itself," Schmitt said. "That isn't the only factor. You have to keep a total launching and controlling and training system at a high level of competence. To stretch out at Cape Kennedy or Houston would be extremely difficult. There would be serious safety and flight problems."

In other words, too slow a rate of launches would affect efficiency and safety in the organization of both N.A.S.A. and its contractors. These demands must be traded off against strictly scientific considerations. As the President's Space Task Group put it, "the launch rate should permit maximum responsiveness to new discoveries while maintaining mission safety and efficient utilization of support personnel."

Schmitt said that with landings occurring every four months, the findings of one mission would affect the mission-after-next.

#### **Toward a "Balanced" Space Program**

As for the recent departures of scientists from Houston, Schmitt indicated that these had been "blown out of proportion. Any departure has to be put in perspective against those who stayed."

The resignation of Professor Eugene

Shoemaker of the California Institute of Technology did not surprise Schmitt. It has been known for two years, Schmitt said, that Professor Shoemaker's responsibilities as chairman of a department at Caltech would take him away from major responsibilities in the Apollo program after the Apollo 13 mission now scheduled for next spring.

Schmitt also said that there had been "a lot of science on Apollo 11" and that this had been due to the efforts of "N.A.S.A. engineering management," the very people who are blamed for insensitivity to the claims of science.

At the same press conference, Dr. Findlay said that if the commitment to the outer-planet tours was to have any meaning, the Nixon administration would have to request from Congress next January the funds for a 1974 precursor probe to Jupiter. The experience of this probe would come early enough to allow last-minute changes in the outer-planet-tour craft.

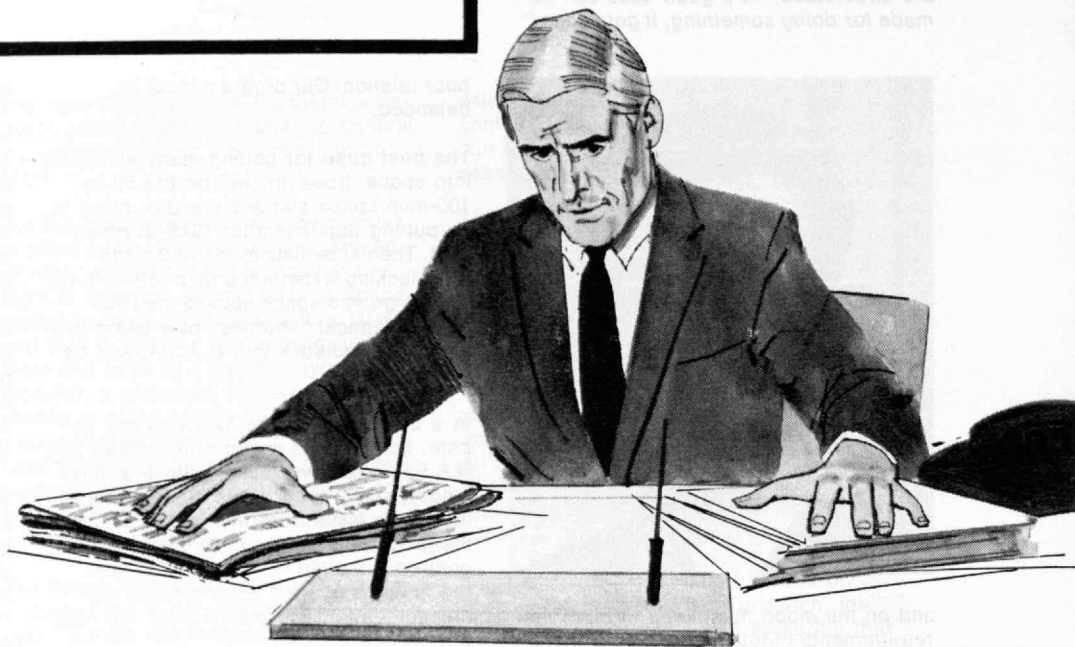
Dr. Pickering, whose Jet Propulsion Laboratory led the work on the unmanned lunar Surveyors and the Mariners to Mars and Venus, said, "Looking to the future, we should be concerned that efforts toward a space station and man on Mars should not so dominate that the other gets cut back."

The scientists made it clear at Hanover that they were waiting for N.A.S.A. to keep its word about a "balanced" program.



*Victor K. McElheny is Science Editor of the Boston Globe. He was formerly European Editor of Science, following one year as a Nieman Fellow at Harvard University.*

# What Next ?



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# The Dance Over Fire and Water

## How Long Can Man Survive?

### The Subversive Science: Essays Toward an Ecology of Man

Paul Shepard and Daniel McKinley, Eds.  
Boston, Houghton Mifflin Co., 453 pp.,  
\$8.95

Reviewed by  
William W. Seifert  
Professor of Civil Engineering and  
Electrical Engineering, M.I.T.

Today's newspapers and periodicals assault us almost continuously with accounts of ways in which we are polluting our lakes and rivers with chemicals, garbage, and waste heat, and contaminating our atmosphere with exhaust fumes, smoke, noise and radioactivity—killing off whole species of wild life, eroding our land and depleting valuable mineral resources. At the same time, we are told that the population of the world is increasing at the unprecedented rate of 1.8 per cent per year, which, if continued, will lead to a doubling of the 1969 total of 3.5 billion persons by approximately the year 2007.

How long—with this doubling, and another, . . . and another, and with the accompanying degradation of the environment—can human life continue to offer the joys and hopes we know today? Or indeed, can the human race even retain its essential characteristics as we now know them?

Paul Shepard and Daniel McKinley have compiled, under the title *The Subversive Science*, an anthology of thirty-six essays which, taken as a whole, explore very broadly the relationships of human beings to each other, to plant and animal organisms, and to the environment in general. They examine man's individual attitudes and values, his cultural diversity, and his changing social patterns—all of which have been dramatically affected by the introduction of modern technology.

It is with this breadth that the editors define their use of the word *ecology*. In the introductory essay, Shepard says: "it [ecology] is not a discipline: there is no body of thought and technique which frames an ecology of man . . . Ecological thinking . . . requires a kind of vision

across boundaries . . . and . . . as applied to man [ecology] faces the task of renewing a balanced view where now there is a man-centeredness. . . . We must find room in 'our' world for all plants and animals, even for their otherness and their opposition. . . . If nature is not a prison and earth a shoddy way-station, we must find the faith and force to affirm its metabolism as our own—or rather, our own as part of it. To do so means nothing less than a shift in our whole frame of reference and our attitude towards life itself, a wider perception of the landscape as a creative, harmonious being where relationships of things are as real as the things. Without losing our sense of a great human destiny and without intellectual surrender, we must affirm that the world is a being, a part of our own body."

Shepard continues: "The ideological status of ecology is that of a resistance movement. Its Rachel Carsons and Aldo Leopolds are subversive (as Sears recently called ecology itself). They challenge the public or private right to pollute the environment, to systematically destroy predatory animals, to spread chemical pesticides indiscriminately, to meddle chemically with food and water, to appropriate without hindrance space and surface for technological and military ends; they oppose the uninhibited growth of human populations, some forms of 'aid' to 'underdeveloped' peoples, the needless addition of radioactivity to the landscape, the extinction of species of plants and animals, the domestication of all wild places, large-scale manipulation of the atmosphere or the sea, and most other purely engineering solutions to problems of and intrusions into the organic world."

Surely, such challenges must receive much greater attention in the years ahead. If questioning the very essence of some of our most basic institutions and concepts for the sake of preserving humanity be subversion, then ecologists should be encouraged to be subversive and the title of this book is well chosen. One can only hope that the ranks of these subversives will grow sufficiently rapidly to avert chaos.

The essays following the introduction are grouped into five parts under the head-

ings: "Men as Populations," "The Environmental Encounter," "Men and Other Organisms," "Men in Ecosystems," and "Ethos, Ecos, and Ethics." Finally, to further supplement the references given with the individual essays, the editors have provided a substantial list of additional references for those who wish to gain further insight into this vast and complex subject.

As background for this broad look at ecology, the first essay in Part One, "Men as Populations," reviews the state of our knowledge of the characteristics of the proto-hominoids who inhabited this planet as much as 40 million years ago. From inauspicious beginnings the hominoid population grew to an estimated 125,000 in the Lower Paleolithic age 1 million years ago. In the next 600,000 years the population increased approximately fivefold. Since then, not only the population but its rate of growth have been increasing rapidly, with the result that the population has grown by a factor of five just in the past 300 years. If growth were to continue at the present rate of 1.8 per cent per year, the world's population would increase by a factor of 250 and reach nearly 900 billion persons—approximately 6,000 per square kilometer—in the next 300 years.

Predictions of this type have little validity. Nonetheless, this long range view of population growth indicates clearly the extent of our "population explosion." If man cannot control population growth, then other forces surely will take over to limit it. The following essays explore some of these forces.

A large fraction of the world's population is today undernourished. In the essay, "Facts, Fables, and Fallacies on Feeding the World Population," its author Brody develops in some detail the dilemma posed by the fact that "the human population has the capacity and 'will' for indefinite exponential growth whereas the population-supporting capacity of the earth is limited."

If this were not enough, "The Inexorable Problem of Space," as discussed by Paul Sears, bears down upon us. He says: "I am assuming that it is not enough for man to live by bread alone but that in-



tangible as well as intangible values are necessary to justify his persistence. If this be true, the question is not, how many people can exist on earth, but what kind of a life will be possible for those who do." He concludes that "Our future security may depend less upon priority in exploring outer space than upon our wisdom in managing the space in which we live."

Most Americans seem to have sufficient food and sufficient space and appear to be faring reasonably well, with the result that such warnings go largely unheeded. However, Spencer, in the next essay, states that "experiments have convincingly shown that when populations of a number of species are subjected constantly to certain artificial conditions that appear to favor growth and survival of individuals, the result is not only death of many individuals, but after a time, the extinction of the race."

The first essay of Part Two, "The Environmental Encounter," points out that human perception is developed in many ways, not the least of which is the spontaneously creative imagination of childhood. However, in our rush toward urbanization, we are losing many of the possibilities for children to develop or adults to recall powerful memories of days spent in odd lots, tangled woodlands, or along running brooks.

In turn, man's attitude towards his environment has changed with the passage of time. In more primitive cultures, man showed a basic reverence for certain places, which he identified as holy and inhabited by the gods. Likewise, even today, "the lawn, with its vague but nonetheless real social connotations, is precisely that landscape element which every American values most. However, 'the desire to identify ourselves with the place where we live is no longer strong.' For example, typical American homes represent only another 'piece of merchandise, as unrelated to environment as its owner's crease trousers, his wife's spike heels, or their son's space-suit.' Over the years, there has been developed a 'somewhat hostile relationship between the human organism and its social and natural environment, which is expressed in such phrases as 'man's conquest of nature,' or 'man's conquest of space.' As a result, advice about pollution, depletion of natural resources, and overpopulation 'falls on deaf ears, because it falls on the ears of organisms convinced that war against nature is their proper way of life.'"

The essays of Part Three move on to another area and begin to explore man's relationships to other organisms and the lessons we can learn from observation of lower animals. From such studies "we could recognize that there may be more to meeting a population problem than increasing the production or improving the distribution of food or other material goods." "The idea that adaptable mankind may be able to adapt to a new, crowded, tightly integrated, superlatively

artificialized way of living still does not answer the questions as to why this way of living should be a goal so desired, so worthy of attainment." The diversity of living beings on this earth provides us with important analogies for better understanding ourselves and our development. Human fertility is endangering this diversity.

As has been amply demonstrated, we run a great peril when we disturb any of the fine balances which exist within a "normal" environment. Diversity and stability go hand in hand, and as we tamper with the environment—not only at the level of the animals but also at the germ level—as with new therapeutic procedures, we run grave risks, the consequences of which we cannot predict. Increasing radiation levels and the profligate use of pesticides pose threats which are equally grave and equally unpredictable.

Part Four, first defines the study of ecosystems as the study of wholes first and parts later. Hardin puts forward the concept that the idea of a system is one of the most important ideas in modern science, "and it is almost impossible to define." Good intentions are virtually irrelevant as an aid in deciding upon the consequences of altering a complex system. Planning, if it is to be successful, certainly must be done in a broad systems sense. However, getting society to accept plans on the scale needed and insuring that the plans, once implemented, contain adequate self-correcting mechanisms pose challenges which may be beyond us. And, although a systems approach cannot always give answers, it can identify dangers. We already have ample evidence to state that "complexity, diversity, stability with a broad number of species and low entropy are indicators of health." We also know that emotional considerations must be accorded their place in any attempt to consider man's relations with his environment and its resources.

In Part Five, "Ethos, Ecos, and Ethics", the first essay explores the historical roots of our ecological crisis. It states that acceptance of the creed that scientific knowledge means technological power over nature "may mark the greatest event in human history since the invention of agriculture, and perhaps in nonhuman terrestrial history as well." The Christian heritage undoubtedly played a large part in the way western man has exploited his environment—as in Christianity "man shares, in great measure, God's transcendence of nature."

In a later essay, the subject of population is reexamined in terms of its implications relative to land use and urban development, and the irreconcilable conflicts between quantity and quality of life are restated.

The fundamental problems of mankind are not technological but rather cultural, and science should move from being "the sharpener of [man's] sword" to "the searchlight on his universe." "Fullness of

life is a wrestling match. . . . It is union with others in effort and in labor. It is the dance over fire and water."

## The Science of Amplified Light

### Fundamentals of Quantum Electronics

Richard Pantell and Harold E. Puthoff  
New York, Wiley & Sons, 320 pp., \$15.95

Reviewed by  
George W. Pratt, Jr.  
Professor of Electrical Engineering, M.I.T.

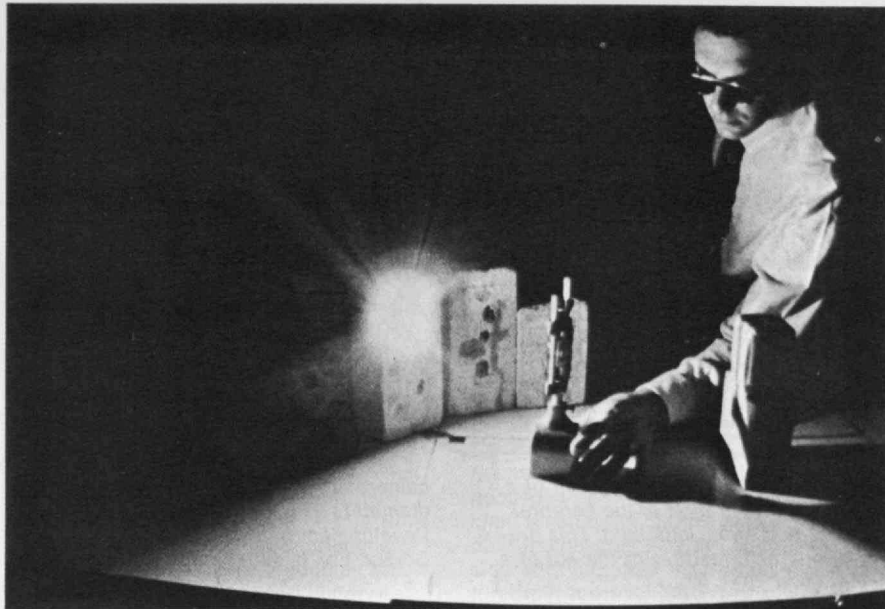
The field of quantum electronics is less than a decade old, if we associate its birth, perhaps arbitrarily, with the appearance of the laser. Although microwave amplification by the stimulated emission of radiation, i.e. the maser, was first achieved by Gordon, Zeiger, and Townes in 1955, the corresponding process of light amplification—the laser—was not proposed until 1958 by Shawlow and Townes and was not realized until 1960 when Maiman succeeded in using  $\text{Cr}^{+3}$  ions in  $\text{Al}_2\text{O}_3$  (ruby).

This success set off a burst of activity which seemed to go in all directions at once. Now coherent radiation, formerly possible only in the microwave domain, became available at infrared and optical frequencies. A vast field of new experiments was suddenly opened up: pulsed lasers, cw lasers, gas lasers, ultra-short high-power pulses, Brillouin and Raman scattering, coherence, photon counting, modulation—on and on goes the list of accomplishments.

This being the situation on the research front, how does one put the pieces together and produce a graduate course or a related text? Especially difficult is a book that can present the basic issues early in the game before it can be assumed that the student has gained much sophistication. Which is more important to show them, the woods or the trees? This book chooses the former. In this context, *Fundamentals of Quantum Electronics*, by Professor Richard Pantell and his associate, Dr. Harold E. Puthoff, both of Stanford University, is a remarkably good book.

As pointed out in the preface ". . . it has become necessary for device-oriented physicists and engineers to assimilate a large background of material that ranges from the basic elements of quantum mechanics to the behavior of such complex macroscopic devices as lasers and parametric amplifiers." As further stated in the preface the authors have attempted to do this from a "unified point of view"—and, I believe, with some success.

The book starts out with a discussion of the density matrix. It is very brief—annoyingly brief until you find out what the authors are up to. Having gone quite directly to the equation of motion of the density matrix and the ensemble average of operators in Chapter I, they consider dipole transitions in Chapter II. The basic equations governing the discussion of much of the rest of the book are devel-



A recently announced laser system generates a continuous power of 1,000 watts. Developed by Sylvania Electric Products Inc., it takes care of its internal heat generation problem by having the working gas (carbon dioxide, plus nitrogen and helium) circulate through a heat-exchanger between passes through the active "lasing" region. The photograph shows a cinder block "heated to incandescence instantly" by focussing the new laser onto it. This is one of the more dramatic products of the new science of quantum electronics, the subject of a useful new text by Richard Pantell and Harold E. Puthoff. (Photo: Sylvania Electric Products Inc.)

oped. Here the interaction between the electromagnetic field and the medium which acts as a "driving source," as described by the diagonal and non-diagonal components of the medium density matrix, is explained. These basic equations are then applied in Chapter III to a discussion of resonant processes, taking up the ideas of a complex susceptibility, line shape, rate equations, and the laser oscillator. Sticking to the boundary condition that this is a presentation intended for a first encounter, it deserves a "well done".

Chapter IV is a very brief treatment of specific lasers and laser operational behavior. It is a very hasty treatment, omitting many details, but it does convey a picture of how a laser functions, and a lot of actual numbers are given—line widths, lifetimes, frequencies, population inversions, output powers, Q-switching times and powers, and so on.

In Chapter V a very simple treatment of nonlinear effects is given. Again, only the surface is scratched and one could complain that it is too superficial. However, from the student's point of view it is a very useful discussion. In fact, this is just the reaction of those to whom I have shown the book.

And so it goes: Chapter VI discusses field quantization, Chapter VII the coupling between the electromagnetic field and lattice vibrations, and Chapter VIII electrons in crystal lattices. Here energy bands are introduced, optical properties of solids, and the semiconductor diode laser. Each chapter has a selection of problems and a set of useful references. One could take issue with the authors over just how much introductory material should be included, but this is very dependent on the preparation of the reader. The authors have made excellent use of their 100-odd pages.

## The Emperor's Invisible Clothes

### The Third Listener Personal Electronic Espionage and Secrets of Electronic Espionage

John M. Carroll  
New York, E. P. Dutton & Co., 1966, 1969

Reviewed by  
Bernard T. Feld  
Professor of Physics, M.I.T.

I was brought up in the tradition of the heroic spy figure of the pre-World War II novels of intrigue. Nowadays Le Carré, Deighton, and others have cut the spy image down to size, but my disillusion came even earlier. I met Allan Nunn May, rather casually, during the war, and knew Klaus Fuchs moderately well in Los Alamos—well enough so that when I visited Harwell after the war, when accommodations were still in short supply, he put me up for the night in his rooms. This was very shortly before his arrest, but I had no idea of his treachery and his troubles; I knew him as a very bright but very shy man who generally avoided discussing anything except physics.

One can learn a lot about espionage from the memoirs of the outstanding practitioners. The (usually involuntarily) retired secret agent is a fish out of water: having been exposed, he is no longer useful; he does not have the kind of influence that commands high-paying jobs; he will probably never be trusted again by his former employers (because all successful spies have had to be convincing double-agents, and hence one can never be sure where their loyalties really lie); yet there is the tremendous ego drive, which drove him into spying in the first place, to be satisfied. So, if he can avoid taking to the bottle, he takes to the pen. The results may be not the most reliable chronicles of our confused times, but for one interested in the history and pathology of the cold war such memoirs provide a fascinating set of footnotes and raise some intriguing questions.

However, in my opinion, the exploits of the Pentkovskys and the Philbys, as far as their influence on the history of our times, add up to a great big zero. First, the major spy networks are so extensive and so interpenetrated that they cancel each other out. And, more important is the nature of the information in which they deal. The really large facts—types of weapons and weapons systems—simply are not and cannot be kept secret. The details are such that spying can provide small immediate advantages, but bureaucratic inertia and stupidity, and interbureaucratic rivalries, guarantee the impossibility of instant reaction. And the extent of the networks produce such a large volume of information of such mixed reliability that the required sifting introduces further time delays.

The problem has been intensified, rather than solved, by the applications of the latest technologies to espionage. This becomes increasingly clear as one reads through the two short but densely packed volumes by Mr. Carroll: *The Third Listener* on personal (small scale) espionage: "bugging," wiretapping, and the like; and *Secrets of Electronic Espionage* on large scale espionage: radio and radar interception, photography from high-flying aircraft and satellites, etc. These are, in effect, handbooks of available measures and countermeasures, meticulously assembled by a man who has clearly been involved in the field, who is sufficiently expert to have been hired on the teaching staffs of at least two large universities, who is former Managing Editor of *Electronics Magazine*, and apparently acquainted on a first-name basis with most of the more successful "private eyes" who specialize in electronic sleuthing and countersleuthing. The personal anecdotes which interlace the otherwise dull and dry narrative of *The Third Listener* help—but not enough—to raise it somewhat above the level of the kind of do-it-yourself popular science books which used to circulate widely among mechanically and electrically inclined teenagers in the uncomplicated days before World War II.

Still, the details of available measures and countermeasures bear out my thesis—that espionage is, like nuclear deterrence, a completely self-cancelling



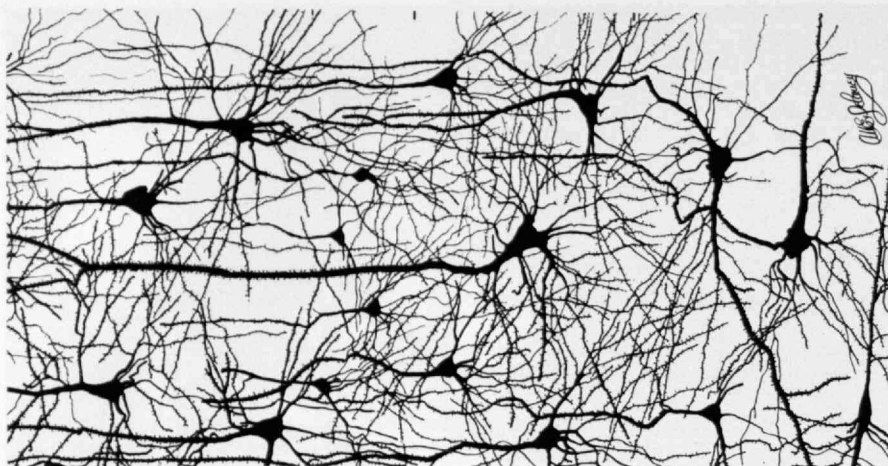
game. In the case of nuclear deterrence, however, the facts are sufficiently out in the open so that most people who have taken the trouble to study them can agree we would be safer if the level of deterrence on both sides were much lower. However, with regard to espionage, most of us are still inclined to accept any level of F.B.I., C.I.A., N.K.V.D., Sûreté, or M-5 operation that our governments determine, in their secret wisdom, to be necessary. And as is the case of nuclear weapons, these levels are steadily escalating. If it were merely a question of money, it might be difficult to object to this silly game of running like mad just to neutralize the spying of the other side. But many people are beginning to wonder whether our spy systems are not taking on lives of their own and committing governments and nations to foolish and dangerous ventures.

An interesting aspect of this game of intrigue and counterintrigue is the ease with which one is drawn into it—it must appeal to some deep instinctual need. Thus, the author of these books, despite his evident intent of adopting an even-handed approach, keeps being drawn into the controversial aspects of eavesdropping, sometimes on the side of the victims and sometimes on the side of "law-and-order." Generally, he presents a fair evaluation of the capabilities of the various techniques, but occasionally he allows himself to be sucked into blind acceptance of the exaggerated claims of the technicians, as when he discusses the capabilities of a "battlefield radar . . . no bigger than a rolled-up newspaper . . . (which) can tell whether a person . . . (is) a man or a woman."

Nor is this reviewer immune to the disease. More than once, in reading about the details of systems which might be regarded as top-secret, it occurred to me to question the motivation of the author. Is he just another academic trying to get ahead, with seven kids to worry about, or is this some subtle scheme of military intelligence to rationalize and justify its intrusion into national and international life? Or is it perhaps a scheme to lull the "enemy" into a sense of false security, into believing that he understands and can therefore cope with our techniques of espionage and intrusion?

Accepting these books on their face value, however, if you are worried about your phone being bugged—or are interested in doing some bugging on your own—*The Third Listener* will tell you what you need to know, with diagrams, or where to get the device you need.

If, on the other hand, it's the larger picture, of what it all adds up to in terms of national and international security that concerns you, neither of these books will give you much aid or comfort. In the end, I am still left with the conviction that the emperor has no clothes.



*Drawing from a photomicrograph of a Golgi-Cox preparation of the cerebral cortex of a six-year-old child. This drawing of neurons, made with the aid of a*

*camera lucida, is magnified by 250 diameters. (From J. L. Conel, Postnatal Development of the Human Cerebral Cortex, Vol. 8, 1967)*

## Intelligence is Not Easily Made Intelligible

### The Shape of Intelligence: The Evolution of the Human Brain

H. Chandler Elliott

New York, Scribner's, 303 pp., \$12.50

Reviewed by  
Gerald Schneider, Assistant  
Professor of Psychology, M.I.T.

Every expression of an animal—every perception, memory, thought, and emotion—is causally related to the activity of the nervous system. Given this assumption, then the animal we believe to be the most complex from the standpoint of psychology must have the most complex of nervous systems. Since the electrochemical activities of the neural elements, the neurons, are similar even in widely different animal species, the complexity that makes man unique must lie in the *structure* of this system. The long extensions of nerve cell bodies from intricately branching trees, interweaving with each other to form a great system of linkages between the instigating impulses, of a sensation of a memory or an internal rhythm, and the decisive final output leading to a response. It is the pattern and efficacy of these interconnections in man—mainly in the region of greatest evolutionary change, the brain—that defines the shape of his intelligence.

Thus the anatomy of brains—from the gross forms viewed directly to the subtle structures uncovered by microscopy—is a subject of unending challenge to scientists and a realm of intrigue and curiosity to others who consider its significance for everything we value, even for the ability to value.

But how does one get started learning about this exciting area? Alas, the neuroanatomy texts are compendia of details, thoroughly boring to the beginner faced with myriads of Latin terms, multitudes of

synonyms for structures found in the brains of many species. One can find many little books that picture the brains of various animals and introduce the amazing fact that—with all their differences in gross appearance—nearly all vertebrate brains, especially those of the mammals, contain structures quite similar to those in man's brain, though varying in size and elaboration. But how did this come about, and what, if anything, does it tell us about human nature—i.e., how do these structures function in controlling our behavior? Coherent answers to these questions are not found in the popular literature.

Thus, the need is great for a book useful as an introduction to the anatomy and functions of the brain, written by a researcher and scholar of some authority in the neural sciences. It was with great anticipation of this need being met that I opened the book, *The Shape of Intelligence*, written by H. Chandler Elliott, the author of a well-known text in neuroanatomy. The illustrations are excellent for an introductory book of this nature. The outline is encouraging: beginning with a speculative account of the evolution of the first cells, he spins a tale of the evolution of the brain, "a tale logical, engrossing, and significant, with the human brain as its climax."

Sponges were inferior to coelenterates because they lacked true nerve cells for integrated control of body movements. The earliest diffuse nerve nets led to the evolution of specialized, interconnected ganglia in insects and squid, but the lack of unity among these ganglia placed a limit on invertebrate intelligence that could not be overcome except by a basically different organization.

The decisive "outlaw breakthrough" occurred with the evolution of the simple neural tube of the first worm-like protochordates. In the evolution of the vertebrate brain, or in the development of the

human embryo, "every brain feature grows logically from the tube." Elliott adds an overview of the functions of the major brain regions. Of course, the brain-stem is not really "the fish in your brain"; the cerebellum may be "the computer in your brain" but not really any more than the whole brain is a biological computer. Such metaphors convey a feeling for the subject and may not lead the student too far astray.

We must bear with the author as he fills in great gaps in the tale of evolution, or tries to make sense of neurological phenomena, by reasoned constructs. It may be discovered that Nature did not follow this line of reasoning, but Elliott's constructs do lend coherence to a topic which can easily seem incoherent. Thus the student learns some comparative neurology as he might learn history from a historical novel. For the indulgence of his fancy, he loses a little contact with reality, but—like in any good history-based saga—this may seem a small price for the delight and knowledge it offers. Unfortunately, the price is higher than such a student could know. The small inaccuracies can perhaps be passed over with little harm done, although one encounters a considerable number. But some of the author's attempts to fill in the gaps in present knowledge are misleading with regard to the basic theme.

The general senses, tactile and kinesthetic, are considered to have played a comparatively minor role in the evolution of the brain, yet many investigators would argue that a specific routing of somatic sensory information to the cerebral hemispheres is a distinguishing mark of mammalian, as compared with all non-mammalian, vertebrates. The author reveals an unduly reflexological bias when describing "the first step toward higher motor intelligence" as the development of a chain of reflexes which serve as the basis for primitive locomotor movements. This overlooks many experiments showing considerable locomotor ability in the absence of specific inputs, and hence without reflexes. The "first step" may just as well have involved the harnessing of rhythmic discharge patterns within the central nervous system; such endogenous patterns appear to be fundamental to much nervous activity, including its "higher" manifestations. Furthermore, the author's insistence that infants must learn to walk ignores the evidence that walking will occur when neural development has advanced to a certain point regardless of the parent's attempts to help the child practice.

An engaging chapter on the basal ganglia, "the mouse in your brain," is in large measure a fanciful construction to fill in an area of vast ignorance. Unfortunately, damage to these structures, even in small rodents, does not cause the defects in instinctual behavior patterns which Elliott's account would lead you to expect. His hunches may be partly correct, but would it not be more helpful to point a little more toward our ignorance? At least, without more basis, he should

spare the mouse this indignity.

Notions which have some use in the medical clinic can be misleading if applied too generally, especially to lower animals. For example, the function of the neocortex is presented as if based mainly on long transcortical connections, yet much experimentation with animals indicates that the connections to and from the subcortex are more important.

The text includes too many old notions that in the light of modern research have become highly questionable, disproven, or just no longer useful. For over a decade, evidence has been accumulating to rule out the view that the optic lobe of the midbrain "has become vestigial in mammals." The view that the cerebral hemispheres are "derived from the ancient smell brain," to be sure a less testable notion, has had its usefulness considerably curtailed by evidence of major forebrain representations of visual and auditory inputs in the non-mammalian hemisphere, quite independent of areas receiving olfactory input.

One is led to believe that the hypothalamus, recognized as a focal structure in visceral regulation, interacts with higher levels mainly in visceral disorders. Its important connections with the "limbic" structures of the end-brain are neglected, while the latter structures—called by the misleading but once common term "rhinencephalon"—are not given the importance for higher functions which modern research has indicated for them. Indeed, without the limbic system human mentation—however dependent it may be on the neocortex—would not have coupled with it those more elusive, intangible qualities of delight or suffering which the author includes in his view of intelligence.

Thus, the need for a readable and not-too-misleading introduction to comparative neurology, a useful first guide into the complex jungle of the functioning brain, is not adequately met. Yet the imaginative and lucid literary style of Elliott's prose, and the exciting panorama he describes, lead me to hope that the book will be rescued in a revised edition. Such an evolution of his chapters may not have been envisaged but the author should not be averse to it. In his own words, "The password of triumphant evolution has always been: 'A creator shalt thou create'."

## Survey of Applicable Mathematics edited by Karel Rektorys

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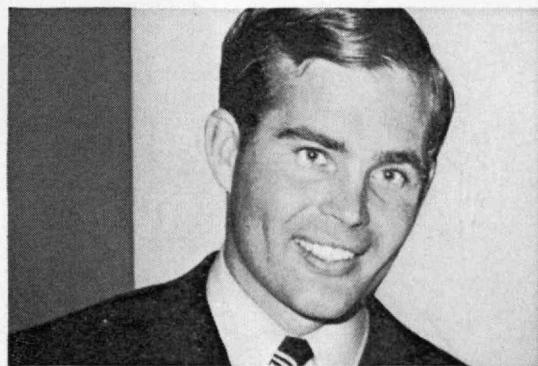
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Gas tungsten-arc welding joins sections of the huge fuel tanks for the Saturn V spacecraft. The tanks, 33 feet in diameter, are made of an aluminum alloy. (Photo courtesy of the Manufacturing Engineering Laboratory, G. C. Marshall Space Flight Center, N.A.S.A.)



Modern welding, challenged by the new materials of the space age, has developed into a complex engineering art

Koichi Masubuchi  
Associate Professor of  
Naval Architecture, M.I.T.

# Welding in Modern Industry

Any science about which little is known involves a degree of public fantasy. A programmer is visualized amidst throbbing computers; a chemist is imagined surrounded by foaming test tubes. Even the less well-known sciences labor under misconceived myths where imagination fills in the vacancies left by missing facts.

Like any other science, the science of welding—or joining processes—also has a public image that involves a degree of distortion. I have found that many people imagine a welder to be a species of mechanic or modern day blacksmith swaddled in thick gloves and protective masks as he envelopes himself in a shower of flying sparks and hot liquid metal. Perhaps decades ago this image would have been more accurate than it is today. The technique of joining materials, however, has developed into the highly skilled and technical discipline it has had to become in order to function in a technological society.

Today, welding encompasses not only the man holding the oxyacetylene torch but the welding specialist who is a highly trained and educated engineer. The welding specialist must be knowledgeable in a wealth of fields and be capable of developing new joining processes to keep pace with new structures and new materials. This specialist, then, is a skilled scientist in a rapidly growing discipline—a far cry from the blacksmith forging metals or the welder of earlier days.

## The Art of Joining in Human Society

If we consider joining processes in a very broad sense—joining of all materials instead of just the welding of metals—it is apparent that the joining process is very basic to our lives. Taken at its simplest, the term “joining process” means nothing more involved than its name implies—the union of two materials, be they ship-building alloys or tinker toys. When viewed in this perspective, then, it is obvious that the joining process is intricately a part of almost all household appliances, clothing, furniture, buildings, machines, and any other of the vast array of artifacts containing at least two parts joined in some way.

The art of joining, in a broad sense, has existed since early man started using primitive tools. Perhaps the earliest form of joining which man learned was simply to tie a stone and wooden bar with a string of grass to make up a primitive hammer. The art of joining kept

pace with the progress of other techniques. As man expanded his skill in using many different materials and fabricating complex tools, machines, and structures, the art of joining also progressed because joining is an important process in fabricating such materials.

For example, the development of electricity in the 1800's brought about electric welding processes. The demand for successfully welded aluminum alloys which were increasingly used for aircraft in the 1930's resulted in the development of inert-gas arc welding processes. Structural failures of welded ships built during World War II sparked a tremendous amount of research on brittle fracture of steel and other metals which has led to the development of high-strength notch-tough materials. With new materials and fabrication processes, man has been able to build new structures such as deep-diving submersibles, supersonic transports, and space rockets.

In this short article, I would like to discuss how the art of joining has progressed, what relationships it has had to the development of other branches of industry, some technical problems facing welding engineers today, and how these problems may be solved.

## Joining Techniques

Today about 40 different processes, used in various applications, are available commercially to join metals. These joining processes, as presently practiced, can be classified into the five basic categories:

1. Fusion welding, in which the parts to be joined are heated until they melt together. Pressure is not a requisite. Examples are arc welding, gas welding, and electron-beam welding.
2. Electrical-resistance welding, which involves first heating by passage of an electric current through the parts to be welded, and second, the application of pressure. Examples are spot welding, upset welding, and percussion welding.
3. Solid-phase welding, in which pressure is applied but the metals to be joined do not melt, except for very thin layers near the surfaces to be joined. Examples are forge welding, friction welding, and pressure welding.
4. Liquid-solid phase joining, in which the parts to be joined are heated to a temperature lower than their



melting points and a dissimilar molten metal is added to form a solid joining upon cooling. Examples are brazing and soldering.

5. Adhesive bonding, in which joints are formed as a result of the molecular attraction exerted between the surface to be bonded and the adhesive. Examples of adhesives are animal and vegetable glues, cements, asphaltums, and various plastics such as epoxy.

The term "welding" is used for those processes included in categories 1 through 3.

Primitive soldering—the ancestor of modern joining processes—dates back to about 3000 B.C. when early man joined materials with copper-gold and lead-tin alloys. As primitive tools became more sophisticated, they required more advanced joining processes, and historic evidence indicates that between 1000 and 1 B.C., iron and steel were forge welded into composite tools and weapons. Because coal and wood were the primary sources of this heat, the joining process and its applications were limited by temperature restrictions.

The development of modern welding processes, including fusion welding processes, started to take place around the late 1800's when the use of electrical energy became practical. A wealth of discoveries contributing to modern joining techniques were made in the 20-year span from 1880 to 1900 by scientists from a variety of nations. Welding processes which were originally developed in this period and still are used widely today include metal-arc welding, electric resistance welding, and oxyacetylene welding. Electric resistance welding is used widely today for the fabrication of automobile bodies and various aircraft parts. Oxyacetylene welding is also used to join sheet metal, plate, and pipe. However, metal-arc welding is by far the most commonly used method for the fabrication of large structures such as ships, pressure vessels, and buildings.

### Arc Welding

In metal-arc welding, an electric arc is produced between a metal electrode and the base plate. An arc is a form of gas discharge (which includes such phenomena as glow discharge, spark discharge, and lightning). Compared with other forms of gas discharge, the arc discharge is characterized by a relatively large current and relatively low voltage, about 200 amperes at 20 volts for

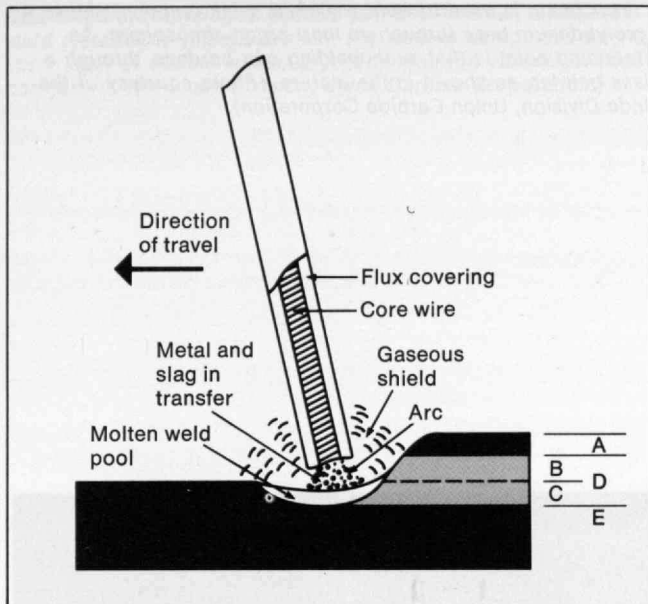
a steel electrode 5/32 inch in diameter. An electric arc produces an extremely high temperature in the arc column, on the order of 10,000° K.

Due to the intense heat generated in the arc, the metal near the tip of the electrode melts. Metal drops are poured between the two surfaces to be joined to wet them and, as they freeze, produce a bridge of solid metal between the surfaces. When a tungsten electrode is used the electrode does not melt; an additional wire, called filler wire, is used to provide molten metal drops. Metal-arc welding is, in a broad sense, very much like casting except that it is done on a local scale. This added metal has a composition and melting point similar to that of the base metal. In brazing or soldering, by contrast, the filler metal is usually of different composition and has a melting point considerably below that of the base metal.

A basic problem in joining is weld contamination. Molten metal particles absorb and react with gases such as oxygen, nitrogen, and hydrogen in the surrounding air and moisture, producing porous and brittle weld metal. This problem has been noticed since the early days of welding. When the first U.S. patent on arc welding was granted to Coffin in 1889, a bare wire was used as the electrode. At that time ferrous welds made with oxyacetylene blowpipes proved vastly superior to bare metal and carbon arc welds.

The phenomenal growth in the use of arc welding started after Kjellberg, a Swede, introduced covered electrodes in about 1910. In 1912, Strohmenger obtained a U.S. patent on an electrode coated with blue asbestos with a binder of sodium silicate or water glass. With these innovations it became possible to produce impurity-free welds of carbon steel. From this time on, numerous types of covered electrodes were developed. Coating, which melts simultaneously with the core rod, performs several functions including stabilizing the arc, producing gases to shield the arc from the surrounding air, and reacting with the molten metal to purify it. It also produces slag to cover the solidified metal, providing slow cooling and preventing further reaction between the weld metal and the surrounding atmosphere. Even though many welding processes have been developed recently, shielded metal-arc welding using a covered electrode represents a major part of the welding industry today, especially in the welding of ordinary carbon steel which is still the largest segment of the welding business in dollars as well as in tonnage.

The 1930's saw another upsurge in joining process innovation, caused partly by the greater use of welding and increased application of all joining processes in World War I. Early in the decade, efforts to mechanize metal-arc welding in the United States led to various automatic arc welding processes including submerged-arc welding. The name "submerged-arc" comes from the fact that the welding zone is covered and shielded by a blanket of granular, fusible material known as flux; thus the welding arc is invisible. A continuous bare wire is fed mechanically into the arc to provide the weld metal. It was the first successful continuous wire welding process capable of producing a high quality carbon steel



*Deposition from a flux-covered metal-arc electrode. The electrode's outer layer has a number of functions: generating a shielding gas; providing slag-forming agents which purify the molten metal; stabilizing the arc; and controlling bead shape. A: slag layer; D: weld deposit (B: weld reinforcement; C: penetration); E: heat-affected zone of the base metal.*

weld at a high production rate. With shielded metal-arc welding using ordinary size electrodes, 14 inches long, the welder must stop welding and change electrodes for each weld length of about 8 inches. With the submerged-arc process, continuous welding of a long joint is possible. In addition, using a high current, between 500 and 1,000 amperes for 5/32-inch diameter electrode, instead of 200 amperes for the ordinary covered electrode of the same size, submerged welding provides a very high production rate. The deposition rate, or the speed of producing weld metal, is governed by the amount of arc energy, which is roughly proportional to the square of the arc current. Submerged-arc welding is widely used for the fabrication of large, heavy plates such as boiler plates and decks of large ships. Nearly 15 per cent of the total carbon steel weld metal in the U.S. is deposited by submerged-arc welding.

### Aluminum Brings Inert-gas Welding

During the 1930's when aluminum alloys were increasingly used for airplane structures, attempts were made to develop a technique for successfully welding these metals. Light metals, such as aluminum and magnesium, are chemically active and difficult to weld with covered electrodes and oxyacetylene blowpipes. Weld metals were porous, and chloride and fluoride compounds which were used as flux produced toxic fumes and corrosive slags. Two Americans, Hobart and Dever, experimented with an electric arc operating in an inert-gas atmosphere. These experiments led to the development of the gas tungsten-arc, or G.T.A. process, and several years later the gas metal-arc or G.M.A. process was introduced. In G.T.A. welding the tungsten electrode does not melt (nonconsumable) and a filler wire is used to provide the weld metal, while G.M.A. welding the metal electrode is melted and consumed. Argon and helium are commonly used for the shielding gas.

Success in the inert-gas welding of stainless steel and, surprisingly enough, ordinary carbon steel was not successful until the 1950's. A key to this success was the addition of a small percentage of oxygen to the inert shielding gas which improved welding characteristics without adversely affecting the weld metal properties.

From the inception of gas-shielded arc welding, an attempt was made to replace the inert gas with a cheaper substitute. In the late 1950's it was found that carbon dioxide, sometimes with the addition of oxygen, could be used for welding steel. The carbon dioxide-shielded process is the fastest growing welding technique today. It has taken over about 20 per cent of the arc welding of steel in the past several years, and in the future this process is likely to replace a significant amount of the welding which is done with covered electrodes today.

During the last 15 years many new welding processes have been developed, including electroslog and electro-gas welding, methods using ultrasonics, friction and electron beams, plasma welding and high-frequency resistance welding.

One of the newest joining devices is laser welding. Since the laser was first constructed in 1960, attempts have been made to utilize this powerful tool to produce extremely highly concentrated energy for the joining of metals. Both similar and dissimilar metals have been welded. The short pulse duration available with the present laser limits the section that can be welded to about 0.1 inch. Laser welding, like the whole laser industry, is in the infant stage, its full development yet to be seen.

Through all of these new methods of modern technology the temperature limitations and other restrictions of early joining processes have been largely removed, and consequently, almost all materials used in industry and construction today can be welded.

### Uses of Joining Techniques

The joining process is so very basic to our modern way of life that many facets of its use may easily be overlooked. Adhesive tapes joining wrappings together are commonly used in our daily lives. When you buy meat packages at a supermarket, they are covered with plastic sheets which are often welded by a process called dielectric heating. Overlapped areas of plastic sheet are pressed together while they are heated internally by applying high-frequency electric current through them. Even hair spray is a joining process since its stickiness joins hairs together. Dental and medical activities, especially surgery, involve many forms of joining such as joining broken bones and making dentures.

Although many joining processes are simple techniques used for minor needs, some involve highly developed technologies derived from years of intensive research and experimentation. Such advanced joining processes would include the many forms of joining used in highly complex machines and structures for commercial and military uses such as marine and air vehicles.

### Shipbuilding Breakthrough

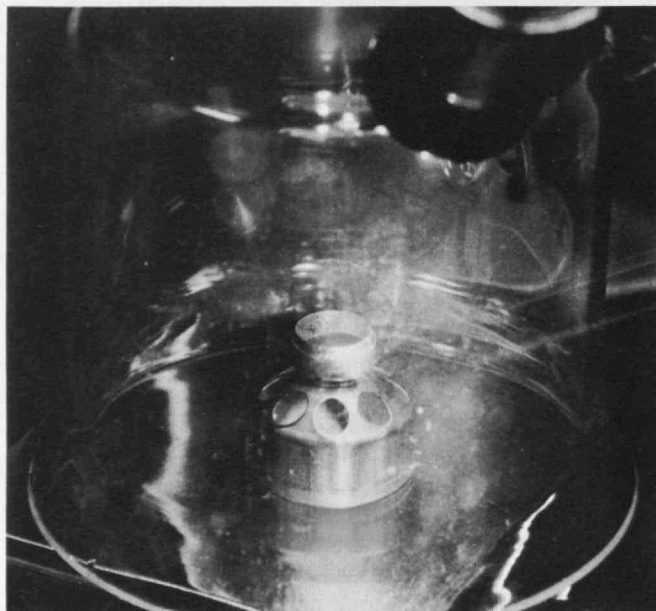
The armament demands of World War II created the first real application of welding techniques on a large scale. During the war, the United States alone built almost 5,000 ships. Without welding, this rapid production would have been impossible. Although structural failures occurred in a number of ships, including several which broke in half, the technique for fabricating welded ships was established between 1945 and 1955. Today, hull structures of commercial and naval ships are almost entirely welded. Improvements in welding techniques and shipyard operation techniques have resulted in remarkable improvements in ship production. Large sections of ship hulls are fabricated simultaneously in various areas of a factory—in many cases indoors to insure sound welding operations—and then assembled by huge cranes and finally welded. A modern shipyard can now fabricate the hull and launch a 200,000 dead-weight-ton ship (or a ship which can carry as much as 200,000 tons of cargo) in about three months; and in another three months engines and fittings are installed, and the ship is completed. Several years ago, the same shipbuilding company would have required twice as long to launch a 50,000 d.w.t. ship. In fact, in 1968, Japan alone launched over 8,500,000 tons of ships, some of which are larger than 300,000 tons. Welding is only a small part of the complicated process of ship production, but it is a very important part. A wise use of welding techniques coupled with a wise overall operation is one key to the achievement of such drastic improvements in the total production rate and cost of the ship.

For aircraft construction, inert-gas arc welding processes successfully join light-metal alloy building materials. Aluminum and magnesium alloys now are joined almost always by this method instead of the covered-arc welding and gas welding that were previously used. Various welding processes are used for the fabrication of many different structural components such as fuel tanks, wing sections, and landing gears. Honeycomb sandwich panels, which are widely used for structural components, are frequently adhesive bonded. Even though many components are welded, the overall aircraft structure is assembled with rivets. The change from primarily riveted structures to welded structures is soon to come. As far as structural materials and joining processes used in the fabrication of commercial aircrafts are concerned, transition from subsonic jumbo jets to the supersonic transport means significant changes, including a change from aluminum to titanium alloys and from primarily riveting to welding.

### The Saturn V

Welding engineers are also participating in man's conquest of space. When the huge Saturn V rocket, which is being used for the Apollo mission, soared into space,

*A laser beam is used to weld a .002-in. thick tantalum sleeve to a molybdenum base through an inert argon atmosphere. An interesting point is that such welding can be done through a glass bell jar, as shown in the picture. (Photo courtesy of the Linde Division, Union Carbide Corporation).*



most television viewers probably appreciated the technical complexity of the vehicle and the precision work necessary to make such a flight not only possible, but successful. What most viewers probably did not realize was the range of individual specialties required in the fabrication of the Saturn V. One such specialty was the welding. The Saturn V has about 50 pressure vessels to contain fuel and oxidizers for propulsion and altitude control, gases for fuel cell operations and breathing, and a multitude of other functions. The loss of any one of these vessels could abort the mission and result in the loss of the astronauts. Some tanks are as large as 33 feet in diameter, and some are exposed to such severe environments as highly corrosive nitrogen tetroxide, liquid hydrogen ( $-423^{\circ}\text{F.}$ ) or helium gas at 5,000 lb./sq. in. Not only did the welds have to be sound, but the tanks had to be fabricated to an exact shape to insure proper performance when the entire rocket was assembled.

Welding plays an important role in ocean engineering. A critical structural component of a deep-diving submersible is its pressure hull, which must withstand the enormous pressure of the deep ocean. Without welding it is almost impossible to fabricate strong and watertight pressure hulls which can be used in the deep ocean.



Gas metal-arc welding is used to join 9% Ni steel, a hard-to-weld material. In this illustration, the steel is being used as the inner shell of double-walled cryogenic storage vessels. (Photo courtesy of The Linde Division, Union Carbide Corporation.)



### Some Problem Areas

Although the broad field of joining processes has found increasing application in a variety of ways, numerous problems still have to be solved by designers and production engineers, as well as welding specialists, in order to advance the technology.

First, welded structures have to be strong enough. Even though welds themselves are strong, fractures may start from defects in welds, such as cracks and pores, and propagate into the base plate; in fact many fractures in actual structures do occur in this fashion. In order to make a reliable structure, it is necessary to make welds with as few defects as possible and to make the weld metal and the surrounding metal resistant to the growth of fractures from these defects.

When welding was first used on a large scale in World War II, little was understood about how large welded structures behave in service. Many structural failures occurred in ships built during the war, sparking a tremendous amount of research on brittle fracture in base metals and welded structures. This research led to improvements in base materials, and there have been very few brittle failures in ships built recently.

The ever increasing demand for faster and lighter ve-

hicles necessitates the use of materials with higher strength-to-weight ratio, or materials which are stronger and/or lighter. A lighter vehicle can be made by using high-strength steels, over about 200,000 lb./sq. in. ultimate tensile strength, instead of ordinary carbon steels with about 60,000 lb./sq. in. U.T.S. A vehicle can be made even lighter by using titanium alloys with 150,000 lb./sq. in. U.T.S., because the density of titanium is less than 2/3 that of steel.

With new structures and new high strength materials, brittleness has again become a problem in the joining process. As the strength level of a material increases, toughness generally decreases. In other words, a material becomes more sensitive to cracks and if a crack does occur, it is more likely to extend. In addition, these materials are more susceptible to weld cracks, and more cracks are likely to occur during the welding process. In these high strength materials, hydrogen cracking and stress-corrosion cracking are also more frequent than in lower strength materials. Therefore, the higher the strength level is, the more difficult it is to produce sound welds, and the structure is more sensitive to the defects.

When designing and developing a new vehicle, it is vitally important to use materials which are weldable. In some cases, it is even wise to use a material which has a lower strength but is easier to weld, because it will give less trouble during fabrication, and such a structure after welding is likely to have fewer defects, resulting in a stronger total product. When the many elements which make up the base metal and the filler metal are considered, as well as the various welding processes available and welding parameters such as arc current, arc traveling and speed, the complexity of the design problem is apparent.

### Distortion in Joining

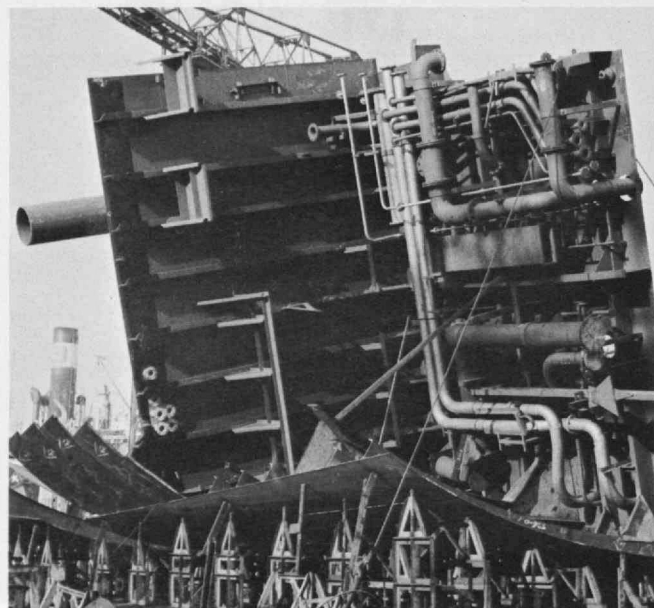
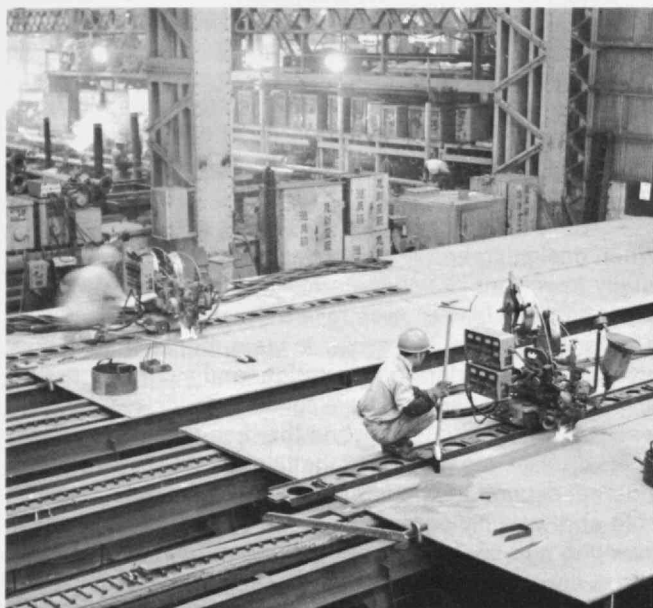
Another problem is "distortion control" or fabricating a welded structure to an exact shape. During fusion welding, the weld metal freezes while the base plate is heated and then cooled. A metal expands when heated, shrinks when cooled, and volume change takes place when it solidifies and the metal undergoes transformation. A metal distorts easily when it is hot, but it gets stronger as it cools. As a result of these phenomena, weld distortion occurs. In some structures, weld distortion is not critical. For example, no ship owner likes to see the wall of a deckhouse warped, but it does not endanger the ship. However, there are cases in which distortion is critical. When the pressure hull of a deep-diving submarine is fabricated, out-of-roundness is critical, because it reduces the bulking strength of the hull. Or suppose that many structural components of an S.S.T., spacecraft, or huge ship are fabricated in various plants and later assembled. Then controlling distortion in the fabrication of these structures becomes not only complex, but critical.

At one time, when welding engineers were mainly concerned with fabricating simple beams and girders for ordinary structures, the job of controlling distortion was handled by company foremen who had worked with these processes for decades. Perhaps these foremen



Submerged-arc welding joins huge plates for supertankers (below, left). In ordinary welding techniques, one side of the plate would be welded and then the entire plate turned over to weld the other side. With the process shown above, all welding can be done from one side. This technique is widespread in Japan, where it was developed, but it still is used very little in the United States.

Ship construction can be completed very rapidly when most fittings are done ahead of time, as shown in this large assembly (below, right).



did a better job than young engineers could do with slide rules, especially since the structures were not very complicated and were made with the same materials and under similar conditions for years. However, the situation is quite different when fabricating complex structures. Materials are new, shapes are complicated, and the dimensional accuracy required is severe. In this modern age, it is natural that computers would be applied to these problems. Research is being conducted at Battelle Memorial Institute in Columbus, Ohio, to calculate distortions which occur during welding fabrication of various structures. An interesting aspect of this study is that the research is currently supported by 24 companies in four countries including the U.S.A., Japan, Sweden, and Italy.

### Are Nondestructive Testing Techniques Too Good?

The field of welding standards also presents possible pitfalls. Due to improvements in nondestructive testing techniques which employ X-ray, ultrasonic, and other devices, an increasing number of small defects can be detected today. Many of these defects would have gone unnoticed in previous years. Unfortunately, however, the ability to judge the effect of a given defect on service or operating life has not kept pace with test equipment discoveries. Because of this disparity, acceptance standards are usually based on the best products which can

be repeatedly produced under laboratory or nearly ideal field conditions. Consequently, the development of non-destructive techniques often causes more repair work. If this idea were carried to an extreme, it would mean that the finer the testing equipment we have for finding smaller defects, the more repair welds we will make. This situation could soon approach the ridiculous. We must find some way to determine what defects, in what shapes and sizes, could be accepted for a specific structure. The acceptance standard will depend upon the type of structure and its service condition. For example, small pores which can be accepted in a carbon-steel weld of a commercial ship may not be accepted in a titanium-alloy weld of an S.S.T. It is important to establish realistic inspection standards that consider not only the existence of defects but the severity and importance of these defects.

These are a few of the more common problems involved in the welding fabrication of large structures. In earlier times, when both the moon and the ocean depths seemed inaccessible, people designed structures using materials easily available on the market. These structures, such as bridges and buildings, were welded with ordinary techniques. These techniques, and normal materials, are still common for many types of fabrication. With the development of space rockets, the S.S.T.,

This assembly of a huge fuel tank for the Saturn V shows both girth joints and longitudinal joints. Each of the tanks made in aluminum alloys has welds of over 500 ft. The huge fuel tanks dwarf nearby electrical lines and trucks. After completion of the fuel tanks, they will be covered by a protective outer skin. (Photo courtesy of the Manufacturing Engineering Laboratory, G. C. Marshall Space Flight Center, N.A.S.A.)

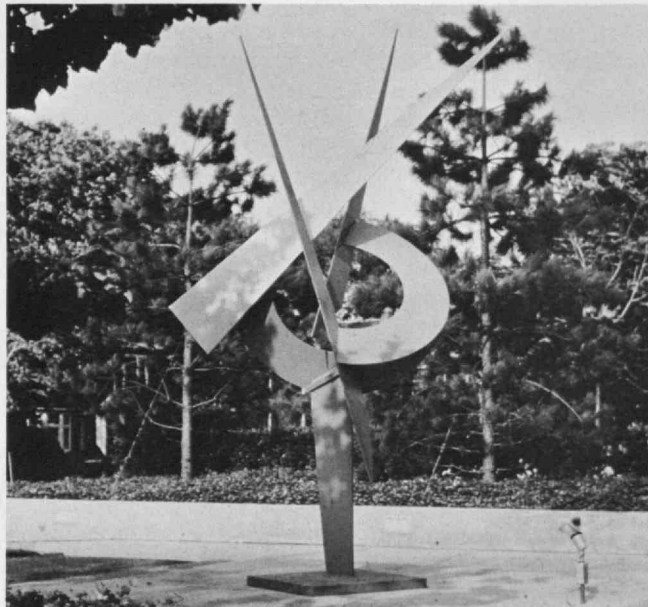
Industrial materials and modern technology are employed in novel ways by contemporary artists. This welded steel sculpture adorns the entry walk of an apartment building. (Photo courtesy of Robert Amory, Cambridge).



and deep diving submersibles, however, the scientist uses extraordinary materials and joining techniques that sometimes approach the limits of technical knowledge. In such cases, the need for precision in shaping the structure, welding the materials, and accounting for possible defects and distortions is at a maximum.

In this short article, I have discussed how joining processes, especially welding processes, have developed, how they are used for fabricating structures, and some problems related to the welding fabrication of large marine and air vehicles. It is true that welding specialists are primarily responsible for solving these welding problems and further developing welding technology. However, better communication with engineers in other fields, including mechanical, civil, marine, metallurgical and electrical engineers, is also very important in solving these fabrication problems.

These engineers in related fields, managers and executives, must understand the vital discipline of welding when considering the fabrication of today's complex structures. More efficient production will be achieved if managers and co-workers understand the problems facing modern welding engineers.



#### Suggested Readings

David C. Martin, "Modern Welding," *International Science and Technology*, No. 66, June, 1967, pp. 22-44.

Koichi Masubuchi, "Welding Problems in Shipbuilding," *Marine Technology*, Vol. 6, No. 7, January, 1969, pp. 66-75.

Arthur L. Phillips, ed., *Current Welding Processes*, American Welding Society, New York, 1964.

Arthur L. Phillips, ed., *Modern Joining Processes*, American Welding Society, New York, 1966.

Koichi Masubuchi is the author or co-author of over 60 papers on the welding of high-strength steels and aluminum alloys, brittle fracture, weld cracking, heat flow in welds, residual stresses (on which he has co-authored two books) and weld distortion. A Naval Architecture graduate of Tokyo University—where he later obtained his doctorate—he began his career at what is now the Ship Research Institute, Tokyo. Between 1958 and 1968 he held a series of posts at Battelle Memorial Institute, Columbus, Ohio, starting as a Visiting Research Fellow and becoming Technical Advisor. He joined M.I.T. as Associate Professor of Naval Architecture last year. He is currently writing a book on the fundamentals of arc welding, and preparing a textbook on Materials for Ocean Engineering.

Sir Peter Medawar's announced purpose in this essay is "to draw certain parallels between the spiritual or philosophic condition of thoughtful people in the seventeenth century and in the contemporary world . . ." A careful reading of the title page, below, will make obvious the truth of his initial thesis.

# THE ACTORS REMONSTRANCE,

OR  
COMPLAINT:

FOR

The filencing of their profeffion, and banishment from their severall *Play-houses*.

In which is fully fet downe their grievances, for their restraint; especially since Stage-plays, only of all publike recreations are prohibited; the exercife at the Beares Colledge, and the motions of Puppets being ftill in force and vigour.

As it was prefented in the names and behalves of all our London Comedians to the great God PHÆBUS-APOLLO, and the nine Heliconian Sisters, on the top of PERNASSUS, by one of the Masters of Requests to the MUSES, for this present month.

And published by their command in print by the Typograph Royall of the Castalian Province. 1643.

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LONDON, Printed for EDW. NICKSON.

*Ianuar. 24. 1643.*



Man need not face the future with pessimism and gloom. Let him think instead of the power of his growing knowledge and the recency of his establishment on Earth as a biological success

Sir Peter Medawar  
Director  
National Institute for Medical Research (London)

# On "The Effecting of All Things Possible"

The title of this essay, or if you like its motto, comes from Francis Bacon's *New Atlantis*, published in 1627. The *New Atlantis* was Bacon's dream of what the world might have been, and might still become, if human knowledge were directed towards improving the worldly condition of man. We do not read it today for its sociological insights, which are non-existent, nor as science fiction, because it has a general air of implausibility; but there is one high poetic fancy in the *New Atlantis* that stays in the mind after all its inventions have been forgotten. In the *New Atlantis*, an island kingdom lying in very distant seas, the only commodity of external trade is *light*: Bacon's own special light, the light of understanding. The Merchants of Light who carry out its business are members of a society or order of philosophers who between them make up (so their spokesman declared) "the noblest foundation that ever was upon the earth. The end of our foundation," the spokesman went on to say, "is the knowledge of causes and the secret motions of things; and the enlarging of the bounds of human empire, to the effecting of all things possible."

My purpose in this essay is to draw certain parallels between the spiritual or philosophic condition of thoughtful people in the seventeenth century and in the contemporary world, and to ask why the great philosophic revival that brought comfort and a new kind of understanding to our predecessors has now apparently lost its power to serve and reassure us.

## Toward the Proper Cultivation of Science

The period of English history that lies roughly between the accession of James I in 1603 and the English Civil War has much in common with the present day. It was a period of questioning and irresolution and despondency, of sermonizing but also of satire; a period during which our human propensity towards hopefulness was clouded over by a sense of inconstancy and decay. Literary historians have spoken of a "metaphysical shudder," and others of a sense of crisis or of a "failure of nerve." Of course, we must not imagine that ordinary people went around with long, sunk-in faces as the victims of a spiritual deficiency disease. It was philosophic or reflective man who had these misgivings, the man who is all of us some of the time but none of us all of the time; and we may take it that, then as now, the remedy for discomforting thoughts was less often to seek comfort than to abstain from thinking.

Amidst the philosophic gloom of the period I am concerned with, new voices began to be heard which spoke of hope and of the possibility of a future; which spoke of confidence in human reason, and of what human beings might achieve through an understanding of nature and a mastery of the physical world. I think there can be no question that, in Britain, it was Francis Bacon who started the dawn chorus—the man who first defined the newer purposes of learning and, less successfully, the means by which they might be fulfilled. Human spirits began to rise. To use a good old seventeenth-century metaphor there was a slow change, but ultimately a complete one, in the "climate of opinion." It became no longer the thing to mope.

We shall be taking altogether too narrow a view of things, however, if we suppose that the great philosophic uncertainties of the seventeenth century were cleared up by the fulfilment of Bacon's ambitions for science. Modern scientific research began earlier. The great achievement of the latter half of the seventeenth century was to arrive at a general scheme of belief within which the cultivation of science was seen to be very proper, very useful, and by no means irreligious. This larger conception of purpose, of which science was a principal agency, may be called "rational humanism" if we are temperamentally in its favor and take our lead from the writings of John Locke, or "materialistic rationalism" if we are against it and frown disapprovingly over Thomas Hobbes; but neither description is satisfactory, because the new movement had not yet taken on the explicit character of an alternative or even an antidote to religion, which is the sense that "rational humanism" tends to carry with it today.

However we may describe it, rational humanism became the dominant philosophic influence in human affairs for the next 150 years, and by the end of the eighteenth century the spokesmen of reason and enlightenment—men like Adam Ferguson and William Godwin and Condorcet—take completely for granted many of the ideas that had seemed exhilarating and revolutionary in the century before. But over this period an important transformation was taking place. The seventeenth century doctrine of the *necessity* of reason was slowly giving way to a belief in the *sufficiency* of reason—so illustrating the tendency of many powerful human beliefs to develop into an extreme or radical form before they lose their power to persuade us, and in doing so

to create anew many of the evils for which at one time they professed to be the remedy.

Many reflective people nowadays believe that we are back in the kind of intellectual and spiritual turmoil that disturbed the first half of the seventeenth century. Both epochs are marked, not by any characteristic system of beliefs (neither can be called "The Age of" anything) but by an equally characteristic syndrome of unfixed beliefs; by the emptiness that is left when older doctrines have been found wanting and none has yet been found to take its place. Both epochs have the characteristics of a philosophic interregnum. In the first half of the seventeenth century, the essentially mediaeval world-picture of Elizabethan England had lost its power to satisfy and bring comfort, just as nowadays the radical materialism traditionally associated with Victorian thinkers seems quite inadequate to remedy our complaints. By a curious inversion of thinking, scholastic reasoning is said to have failed because it discouraged new enquiry, but that was precisely the measure of its success. For that is just what successful, satisfying explanations do: they confer a sense of finality; they remove the incentive to work things out anew.

We can draw quite a number of detailed correspondences between the contemporary world and the first 40 or 50 years of the seventeenth century, all of them part of a syndrome of dissatisfaction and unbelief; and though we might find reason to cavil at each one of them individually, they add up to an impressive case. The repudiation of Aristotle and the hegemony of ancient learning, of the scholastic style of reasoning, of the illusion of a Golden Age, is as commonplace in the writings of the seventeenth century as dismissive references to rationalism and materialism in the literature of the past 50 years. Novels and philosophical *belles-lettres* have now an inward-looking character, a deep concern with matters of personal salvation and a struggle to establish the authenticity of personal existence.

### **A Symbol of Man's Aspiration**

Once again we are oppressed by a sense of decay and deterioration, but this time, in part at least, by a fear of the deterioration of the world through technological innovation. Artificial fertilizers and pesticides are undermining our health (we tell ourselves), soil and sea are being poisoned by chemical and radioactive wastes,

drugs substitute one kind of disease for another, and modern man is under the influence of stimulants whenever he is not under the influence of sedatives. Once again there is a feeling of despondency and incompleteness, a sense of doubt about the adequacy of man, amounting in all to what a future historian might again describe as a failure of nerve.

It no longer seems strange to us that Pascal the geometer, who spoke with perfect composure about infinity and the infinitesimal, should have been supplanted by Pascal the great cosmophobe who spoke with anguish about the darkness and loneliness of outer space. Discoveries in astronomy and cosmology have always a specially disturbing quality. Cosmological discoveries bring with them a feeling of awe but also, for most people, a sense of human diminishment. Our great side-real adventures today are both elevating and frightening—and may be both at the same time. The launching of a space rocket is (to go back to seventeenth century language) a tremendous phenomenon. It must have occurred to many who see pictures of it that the great steel rampart from which the Apollo rockets are launched has the size and shape and grandeur of a cathedral, with Apollo itself in the position of a spire. Like a cathedral it is economically pointless, a shocking waste of public money; but like a cathedral it is also a symbol of aspiration towards higher things.

When we compare the climates of opinion in the seventeenth century and today, we must again remember that cries of despair are not necessarily authentic. There was a strong element of affectation about Jacobean melancholy, and so there is today. Then as now it had tended to become a posture. One of a modern writer's claims to be taken seriously is to castigate complacency and to show up contentment for the shallow and insipid thing that it is assumed to be. But ordinary human beings continue to be vulgarly high spirited.

### **A New Concept of Futurity**

The new style of thinking that led to a great revival of spirits in the seventeenth century is closely associated with the birth of science, of course—of Science with a capital S. The "new philosophy" that had been spoken of since the beginning of the century referred to the beginnings of physical science; but we should be taking too narrow a view of things if we supposed that the establishment or instauration of science made up the

whole or even the greater part of it. The new spirit is to be thought of not as scientific but as something conducive to science—as a movement within which scientific enquiry played a necessary and proper part.

What, then, were the philosophic elements of the new revival?

The seventeenth century was an age of utopias, though Thomas More's own *Utopia* was already 100 years old. The utopias or anti-utopias we devise today are usually set in the future, partly because the world's surface is either tenanted or known to be empty, partly because we need, and assume we have, time for the fulfilment of our designs. The old utopias were contemporary societies. Navigators and explorers came upon them accidentally in far-off seas.

What is the meaning of the difference? One reason, of course, is that the world then still had room for undiscovered principalities, and geographical exploration itself had the symbolic significance we now associate with the great adventures of modern science. Indeed, now that outer space is coming to be our playground, we may again dream of finding ready-made utopias out there. But this is not the most important reason. The old utopias were not set in the future because very few people believed that there would be a future—an earthly future, I mean; nor was it by any means assumed that the playing-out of earthly time would improve us or increase our capabilities. On the contrary, time was running out, in fulfilment of the great Judaic tradition, and we ourselves were running down.

During the seventeenth century this attitude changes. The idea of an end of history becomes incompatible with a new feeling about the great things human beings might achieve through their own ingenuity and exertions. The idea therefore drops quietly out of the common consciousness. It is not refuted; it merely fades away.

Two elements of seventeenth-century thought implied the idea of progress, even if it was not explicitly affirmed. The first was the recognition that the tempo of invention and innovation was speeding up, that the flux of history was becoming denser. The second element in the concept of futurity—in the idea that men might look forward, not only backwards or upwards—is to be found

in the breathtaking thought that there was no apparent limit to human inventiveness and ingenuity. It was the notion that what was already known was only a tiny fraction of what remained to be discovered, so that there would always be more beyond. Bacon published his *Novum Organum* at the beginning of the remarkable decade between 1620 and 1630; in it he singled out as the greatest obstacle to the growth of understanding, that "men despair and think things impossible. . . . The human understanding is unquiet," he wrote; "it cannot stop or rest and still presses onwards, but in vain"—in vain, because our spirits are oppressed by "the obscurity of nature, the shortness of life, the deceitfulness of the senses, the infirmity of judgement, the difficulty of experiment, and the like." The hope he held out was of a rebirth of learning, and with it the realization that if men would only concentrate and direct their faculties, "there is no difficulty that might not be overcome."

### Consortia of Intelligences

There is a mood of exultation and glory about this new belief in human capability and the future in which it might unfold. It does not take a specially refined sensibility to see how exciting and exhilarating these new notions must have been. During the eighteenth century, of course, everybody sobers up. The idea of progress is taken for granted—but in some sense it gets out of hand, for not only will human inventions improve without limit, but so also (it is argued, though not very clearly) will human beings.

The seventeenth century had begun with the assumption that a powerful force would be needed to put the inventive faculty into motion; by the end of the eighteenth century it is assumed that only the application of an equally powerful force could possibly slow it down.

Before going on, it is worth asking if this conception is still acceptable—that the growth of knowledge has no intrinsic limit. We have now grown used to the idea that most ordinary or natural growth processes (the growth of organisms or populations of organisms or, for example, of cities) is not merely limited but self-limited, that it is slowed down and eventually brought to a standstill as a *consequence of the act of growth itself*.

May not the body of knowledge also become unmanageably large, or reach such a degree of complexity that it is beyond the comprehension of the human brain?



To both these questions I think the answer is 'no.' The proliferation of recorded knowledge and the seizing-up of communications are technological problems for which technical solutions can be and are being found. As to the idea that knowledge may transcend the power of the human brain: in a sense it has long done so. No one can "understand" a radio or an automobile in the sense of having an effective grasp of more than a fraction of the hundred technologies that enter into its manufacture.

But we must not forget the additiveness of human capabilities. We work through consortia of intelligences, past as well as present. We might, of course, blow ourselves up or devise an unconditionally lethal virus, but we don't have to. Nothing of the kind is necessarily entailed by the growth of knowledge and understanding. I do not believe that there is any intrinsic limitation upon our ability to answer the questions that belong to the domain of natural knowledge and fall therefore within the agenda of scientific enquiry.

The repudiation of the concept of decay, the beginnings of a sense of the future, an affirmation of the dignity and worthiness of secular learning, the idea that human capabilities might have no upper limit, an exultant recognition of the capabilities of man—these were the seventeenth century's antidote to despondency.

You may wonder why I have said nothing about the promulgation of the experimental method in science as one of the decisive intellectual movements of the day. My defense is that the origin of the experimental method has been the subject of a traditional misunderstanding, the effect of reading into the older usages of "experiment" the very professional meaning we attach to that word today. Bacon is best described as an advocate of the *experiential* method in science—of the belief that natural knowledge was to be acquired not from authority, however venerable, nor by syllogistic exercises, however subtle, but by paying attention to the evidence of the senses—evidence from which (he believed) all deception and illusion could be stripped away. The unique contribution of science to empirical thought lay in the idea that experience could be *stretched* in such a way as to make nature yield up information which we should otherwise have been unaware of. The word "experiment" as it was used until the nineteenth century stood for the concept of

stretched or deliberately contrived experience, for the belief that we might make nature perform according to a scenario of our own choosing instead of merely watching her own artless improvisations.

In contrast, an "experiment" today is not something that merely enlarges our sensory experience. It is a critical operation of some kind which discriminates between hypotheses and therefore gives a specific direction to the flow of thought. Bacon's championship of the idea of experimentation was part of a greater intellectual movement which had a special manifestation in science without being distinctively scientific. His reputation should not—and fortunately need not—rest on his being the founder of the "experimental method" in the modern sense.

### **An Assurance of Continuity**

Return now to the contemporary world and our misgivings about the way things are going now. No one need suppose that our present philosophic situation is unique in its character and gravity. It was partly to dispel such an illusion that I have been moving back and forth between the seventeenth century and the present day. Moods of complacency and discontent have succeeded each other during the past 400 or 500 years of European history, and our present mood of self-questioning does not represent a new and startled awareness that civilization is coming to an end. On the contrary, the existence of these doubts is probably our best assurance that civilization will continue.

Many of the ingredients of the seventeenth century antidote to melancholy have lost their power to bring peace of mind today and have become a source of anxiety in themselves. Consider the tempo of innovation. In the post-Renaissance world the feeling that inventiveness was increasing and that the whole world was on the move did much to dispel the myth of deterioration and give people confidence in human capability. Nevertheless the tempo was a pretty slow one, and technical innovation had little influence on the character of common life. A man grew up and grew old in what was still essentially the world of his childhood; it had been his father's world and it would be his children's, too.

Today the world changes so quickly that in growing up we take leave not just of youth but of the world in which we were young. I suppose we all realize the degree to

which fear and resentment of what is new are really a lament for the memories of our childhood.

When Bacon described himself as a trumpeter of the new philosophy, the message he proclaimed was of the virtue and dignity of scientific learning and of its power to make the world a better place to live in. I am continually surprised by the superficiality of the reasons which have led people to question those beliefs today. Many different elements enter into the movement to depreciate the services to mankind of science and technology. I have just mentioned one of them, the tempo of innovation when measured against the span of life. We wring our hands over the miscarriages of technology and take its benefactions for granted. We are dismayed by air pollution but not proportionately cheered up by, say, the virtual abolition of poliomyelitis.

There is a tendency, even a perverse willingness, to suppose that the despoilation sometimes produced by technology is an inevitable and irremediable process, a trampling down of nature by the big machine. Of course it is nothing of the kind. The deterioration of the environment produced by technology is a technological problem for which technology has found, is finding, and will continue to find solutions.

There is, of course, a sense in which science and technology can be arraigned for devising new instruments of warfare, but there is another and more important sense in which it is the height of folly to blame the weapon for the crime. I would rather put it this way: in the management of our affairs we have too often been bad workmen, and like all bad workmen we blame our tools. I am all in favor of a vigorously critical attitude towards technological innovation: we should scrutinize all attempts to improve our condition and make sure that they do not in reality do us harm; but there is all the difference in the world between informed and energetic criticism and a drooping despondency that offers no remedy for the abuses it bewails.

### One Day of Cosmic Time

Superimposed on all particular causes of complaint is a more general cause of dissatisfaction. Bacon's belief in the cultivation of science for the "merit and emolument of life" has always been repugnant to those who have taken it for granted that comfort and prosperity imply spiritual impoverishment. But the real trouble nowadays has very little to do with material prosperity or technology or with our misgivings about the power of research and learning generally to make the world a better place. The real trouble is our acute sense of human failure and mismanagement, a new and especially oppressive sense of the inadequacy of man. So much was hoped of us, particularly in the eighteenth century. We were going to improve, weren't we?—and for some reason which was never made clear to us we were going to grow in moral stature as well as in general capability. Unfortunately we haven't done so. Every folly, every enormity that we look back on with repugnance can find its equivalent in contemporary life. Once again our intellectuals have failed us; there is a general air of misanthropy and self-contempt, of protest but not of affirmation. There is a peculiar selfishness about modern philosophic specu-

lation. The philosophic universe has contracted into a neighborhood, a suburbia of personal relationships. It is as if the classical formula of self-interest, "I'm all right, Jack," were seeking a new context in our private, inner world.

We can obviously do better than this, and there is just one consideration that might help to take the sting out of our self-reproaches. The brave spirits who inaugurated the new science dared to believe that it was not too late to be ambitious. Now we must try to understand that it is a bit too early to expect our grander ambitions to be fulfilled. Today we are conscious that human history is only just beginning. There has always been room for improvement; now we know that there is time for improvement, too. Human beings have a history of more than 500,000 years. Only during the past 5,000 years or thereabouts have human beings won a reward for their special capabilities; only during the past 500 years or so have they begun to be, in the biological sense, a success.

If we imagine the evolution of living organisms compressed into one year of cosmic time, then the evolution of man has occupied a day. Only during the past 10 or 15 minutes of the human day has our life on earth been anything but precarious. Until then we might have gone under altogether or, more likely, have survived as a biological curiosity—a patchwork of local communities only just holding their own in a bewildering and hostile world. Only during this past 15 minutes has there been progress. It is true that we cannot point to a single definitive solution of any one of the problems that confront us—political, economic, social or moral, i.e. having to do with the conduct of life. But—we are still beginners, and for that reason may hope to improve.

### "No Contentment but in Proceeding"

To deride the hope of progress is the ultimate fatuity, the last word in poverty of spirit and meanness of mind. There is no need to be dismayed by the fact that we cannot yet envisage a definitive solution of our problems, a resting place beyond which we need not try to go.

Because he likened life to a race, and defined felicity as the state of mind of those in the front of it, Thomas Hobbes has always been thought of as the archmaterialist, the first man to uphold go-getting as a creed. But that is a travesty of Hobbes's opinion. He was a go-getter in a sense, but it was the going, not the getting, which he extolled. The race had no finishing post as Hobbes conceived it. The great thing about the race was to be in it, to be a contestant in the attempt to make the world a better place; and it was a spiritual death he had in mind when he said that to forsake the course is to die. "There is no such thing as perpetual tranquillity of mind while we live here," he told us in *Leviathan*, "because life itself is but motion, and can never be without desire, or without fear, no more than without sense . . . there can be no contentment but in proceeding."

*Sir Peter Medawar, C.B.E., F.R.S., is Director of Britain's National Institute for Medical Research. This article is drawn from his Presidential Address to the 1969 annual meeting of the British Association for the Advancement of Science.*







Now that many companies, and some unions, are equipped with computers, electronic data processing is becoming a powerful tool for each side in its relations with the other

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# Unions, Employers, and the Computer

In the past five years, companies and unions have moved dramatically from storing information in "mammoth filing systems" to using computers as the base for management information facilities, which help plan strategy and make basic decisions. One result of this change is that unions are making use of computers in their bargainings with company management.

Neither of the parties to the bargaining process has developed essentially new or secret data; what computers do is to facilitate accurate, simplified arrangements of data, revealing patterns as they develop and supplying details as needed. The effect of the computer on bargaining is best seen by starting at an early stage in the evolution of company/union relationships, where no bargaining occurs, and working forward.

## Computers Behind the Lines

The major company use of computers, of course, is for personnel administration. Employee records—basic personal data, skill inventories, compensation records, and so on—must be kept whether or not unions bargain with the company. Trade unions have sought assistance from the computer in a variety of organizing efforts; for example, efforts to "sign up" the still unorganized branches of partially organized conglomerate or multiplant companies.

The computer helps in the preparation of profiles of the work force composition, of union election histories, and of company records of unfair labor practices. The A.F.L.-C.I.O. Industrial Union Department has data banks on all of these matters. For example, the results of more than 50,000 elections conducted under the National Labor Relations Board in the past eight years are available to union organizers. In addition, individual unions may obtain records of their successes and failures, discover where they are being challenged by other unions, and so on. Records of unfair labor practices are available, categorized by company, union and region. These data will help an organizer identify towns, companies and individual plants which may be ripe for unionization drives. By recognizing patterns in anti-union campaigns, he may be able to build more effective counter-campaigns.

Lists of companies whose employees have recently voted a union "out" in decertification elections provide the organizer with targets where a base of former trade

union members and sympathizers exists. Organizers now find it easier to compare conditions in union plants with those in their target plants. In short, these data can help an organizer spot more effectively which regions to organize, which companies resist most effectively, what union campaign methods work most efficiently, and which members of the target work force are the best potential allies.

Trade unions have also used information data banks in lobbying for changes in working conditions. For example, Woodrow L. Ginsburg, who until recently served as Research Director for the A.F.L.-C.I.O.'s Industrial Union Department, describes how computer analysis helped make an effective case for minimum wages for the sawing and logging industry.

Finally, we should mention here a point alluded to both by Ginsburg and by Wilbur Daniels (International Ladies' Garment Workers' Union)—the help that unions now get in coping with the "runaway shop" problem. By correlating names of officers of old and new establishments (obtained from county records and corporation papers, newspapers, and so on) unions can more easily spot companies which, by relocation, seek to evade organization.

All this we can call the "organizing" stage. Next comes the stage of resisted or unconsummated bargaining. Ginsburg cites examples of unions that were able to build strong cases for backwages claims against companies which, over a period of years, had refused to bargain despite the fact that the union was lawfully recognized as the bargaining agent. One such case employed a computer-based analysis of average wage increases received by the workers in the company which had failed to bargain, contrasted with those received in comparable companies in the industry.

## Bargaining with the Machine

In the third stage of relations between company and union, collective bargaining is a "going concern." Here the computer may contribute either (1) in preparations for the negotiation of agreements, (2) during negotiation, (3) in the administration of the agreement; or (4) may be used jointly by management and union in the collective bargaining process.

Preparations for the negotiation of agreements can in-

clude contract analysis, study of company economic profiles, coding and costing of anticipated or proposed demands, and the development of mathematical models to predict work force needs (to help analyze the impact of probable demands on a variety of company dimensions).

In its national survey of key contracts, the Industrial Union Department has put 22 key contract provisions of 208 major contracts (151 manufacturing companies, 57 nonmanufacturing companies), covering 3½ million workers employed in over 4,000 facilities, into its computer system—which is kept continuously updated. This information enables unions to put price tags (from the company viewpoint) on complex union demands. Comparisons of contract benefits of one company with those of its major competitors in the industry or with other comparable firms can have significant bargaining results.

The I.U.D. also coordinates the activities of 77 corporate or industry-wide committees to help unions cope with new problems posed by widely diversified corporations that cut across the jurisdictions of many of them. Various unions dealing with the same corporation seek to hammer out together the basic demands they will make of it. As an aid toward this objective, the I.U.D. has gathered economic profiles of about 200 major companies, providing detailed records of finances, product lines, plant locations, mergers and acquisitions, key officers, relationships with other companies, records of which divisions of a company are profitable and which are not, and so on.

It is not necessary to elaborate on how computers can help unions and companies to estimate the costs of proposed demands. Neither is it necessary to say much about the development of mathematical models—as yet, a relatively infrequent use of information technology both by unions and by companies, though the likelihood is that such modelling will increasingly become recognized as a useful tool for both the parties.

It is clear that the linking of specific files—National Labor Relations Board election results, unfair practice charges, contract analyses, corporate economic profiles—provides the unions with a broad view of the industrial relations picture of the firms with which they deal. It is clear also that if companies can anticipate

the impact of probable demands they are better able to frame alternatives (which may indeed be more favorable to both parties). Such preparations for negotiations, and the administration of agreements afterwards, at present make far more use of electronic data processing than does the process of negotiation itself. Such is the finding of a survey by William G. Caples, former Vice-President for Industrial Relations of the Inland Steel Company and now President of Kenyon College.

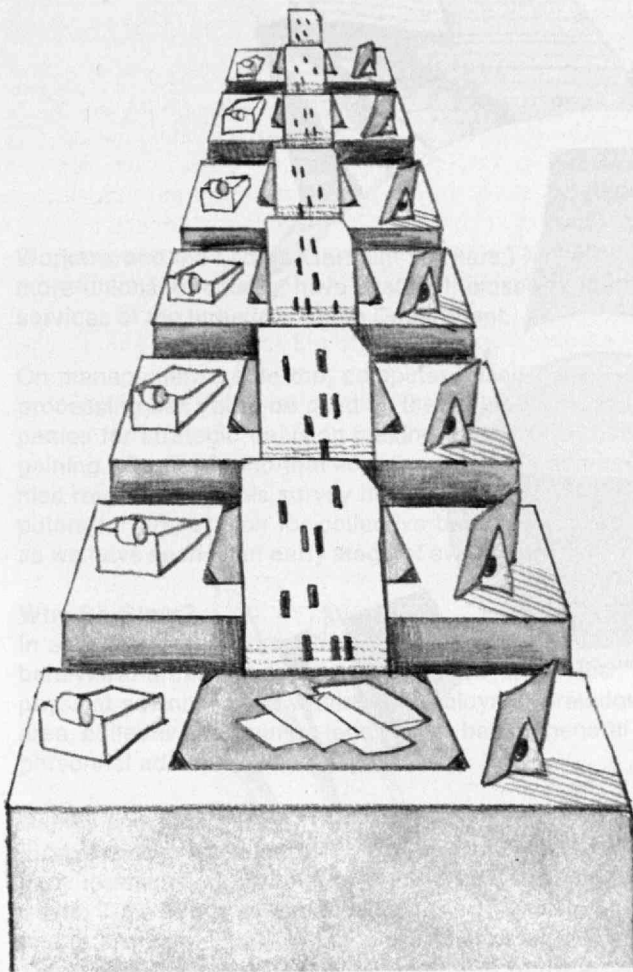
### Checking the Results

The postnegotiation stages involve substantial use of computer technology. For example, the late Charles M. Mason, a Vice-President of United Air Lines, described the aid rendered by computers in the indexing and reporting of grievances—a function especially important in his company, since grievances arise and are handled at so many locations. Such analysis can also help to check union claims that people are disturbed about one or another particular clause in a contract. The grievance index will give the frequency of employees' complaints with respect to any particular contract provision. Similarly, "arbitration analysis" can help in spotting divergent interpretations of specific contract provisions.

Wilbur Daniels has discussed the Ladies' Garment Workers' concern with the enforcement and policing of contracts in an industry where the opportunities for contract violation are many. The sources of the enforcement problem, in this instance, clearly lie in the industry's structure. Many small employers, a high turnover (20 to 30 per cent), a predominantly female labor force with complex piecework incentives, and increasing geographical dispersion: all lead to elusive, inadequate, or inaccurate records. The computer-aided union can now check on whether earnings provisions are being put into practice by auditing payrolls provided on tape. It can police the payment of minimum guarantees. The computer is especially helpful in discerning whether or not a particular group is "making out." The union can easily check contributions to benefit funds by matching contributions to payrolls and company sales. Daniels makes the interesting point that the role of the business agent is still vital in contract enforcement but notes that the computer not only helps the union representative but prods him toward more effective enforcement. Daniels suggests that some of the union's business agents may feel that Big Brother may be watching not only the employer but them also. Daniels feels that the trade union must educate the agent to the uses and potential of "that thing at 1710 Broadway" before such fears fully disappear.

Mason further described computer-aided techniques which go beyond grievance analysis, to help estimate the effectiveness of specific programs—for example, of policies relating to salaries or to turnover reduction. (This field of work is related to the more general one of the cost-benefit analysis of company policies, already familiar to the student of modern management techniques, and in any case, going far beyond the scope of this article.)

In using this technology for the administration of an



agreement, Mason stressed, one must build and reinforce people's confidence in the total information system. He did not feel that this necessarily involved (as has been suggested) the use of a "neutral computer," but rather that the trust of the company's employees will be won through ongoing exposure to the accuracy and fairness of the system. Accuracy and fairness must be a basic operating principle, if we seek to avoid situations like the Renault experience where workers (uninformed about the basics of the management's information system) struck because they protested the use of computers in the selection of people for layoffs. People, he felt, should have the right to discuss what they feel are errors in the system at any time and should be involved from the beginning in the installation of computer applications for such implementing procedures.

Flying people, Mason pointed out, are generally "machine- and change-oriented" and never have objected to the new technology *per se*. They have been con-

cerned only with how the technology affects working conditions. He suggested implicitly that this can be transferable as an operating principle to other situations, although perhaps with some greater measure of effort.

### Exploring the Possible

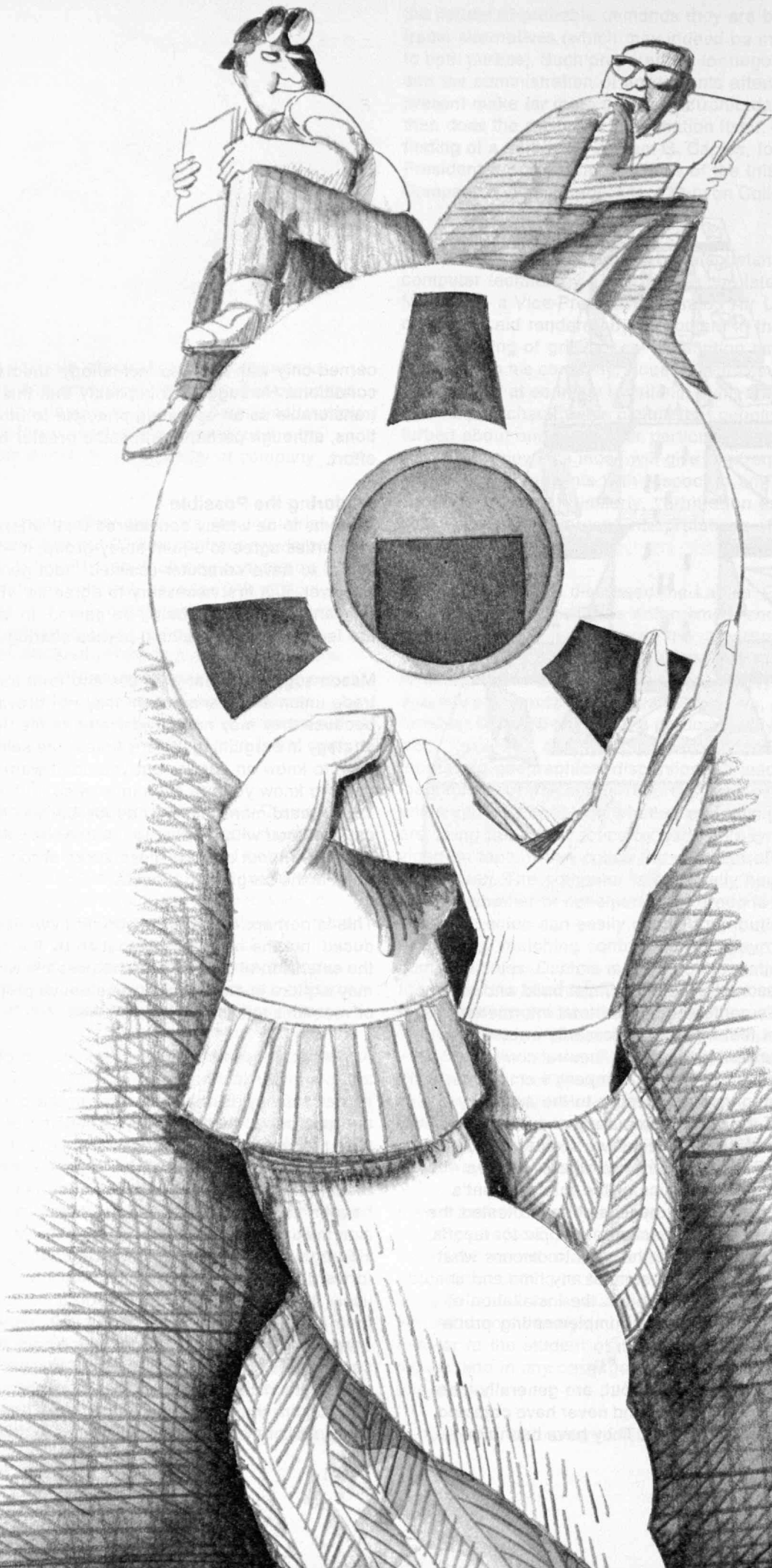
It seems to be widely considered that, where bargaining parties agree to a joint study group, it would be useful to have computer-assisted "fact-generation." However, it is first necessary to agree on what data are relevant to the issues being bargained. In fact, there are few cases of bargaining parties sharing analyses.

Mason suggested that joint use and joint queries by trade union and management may not prevail simply because they may not be advisable in the light of basic strategy in bargaining: "Many times," he said, "you want to know an answer but you don't want the other party to know you are even interested in the question. You discard more than you adopt, but you have to educate yourself with respect to the options without publicity or without sharing these views at too early a point in the bargaining process."

This is perhaps the most important new element introduced into the bargaining situation by the computer—the extension of the realm of the possible which man may explore in mulling over substantive proposals or reactions to substantive demands.

At present it seems clear that the uses of computers and computer technology in collective bargaining are in their infancy. But they are also at the cutting edge, and prospects for the steady expansion of electronic data processing in most aspects of collective bargaining are excellent. On the union side, it is evident that the Industrial Union Department has been the major spearhead in the application of information systems to decision making and strategy in bargaining. Many individual unions, of course, use computers for straightforward housekeeping chores, but at present it is not likely that more than a dozen large ones have developed their own computer-based information systems for bargaining. (Among the unions which have developed such uses are the Machinists, the Automobile Workers, the Communications Workers, the Laborers, the Maritime Union, the Newspaper Guild, the Federation of State, County, and Municipal Employees, the Steel





## International Laborator and European Integra

Workers, and the Ladies' Garment Workers.) Many more unions, of course, have availed themselves of the services of the Industrial Union Department.

On management's side too, computer-based data processing has yet to be used by the majority of companies for strategic decision making in collective bargaining. (Caples found that 46 per cent of the companies responding to his survey have begun using computers for *preparation* for collective bargaining, which as we have seen is an early stage of evolution.)

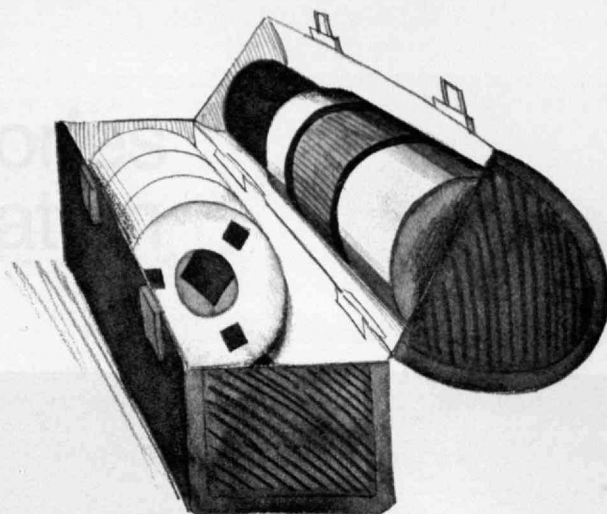
### Why So Slow?

In sum, the use of computers in bargaining and other behavioral areas has lagged behind their use in the physical sciences; and within the employment relations area, collective bargaining tends to lag behind general personnel administration. Why?

Caples and others identify the following basic reasons. First, the data available to the trade union or the company in machine-readable form are often less than adequate. Time is not always available for programming, and in any case, hand methods are often adequate. There have been frequent difficulties with hardware, software, modelling and gaming situations; and trade union leaders, often unfamiliar with and hence fearful of the new technology and language, have too often been reluctant to move ahead.

Caples stresses a second basic consideration. Personnel administration involves counting and identifying people, recording and analyzing their actions, and the collecting and paying of money, all of which lend themselves readily to numerical and logical treatment. Collective bargaining problems, on the other hand, are more loosely structured. Says Caples: "The use of computers presupposes considerable advance understanding of the problem scope, availability of accurate input, reliable factorial weighting and logical resolution of problems; somehow these elements still are rarities in the bargaining process."

However, in Caples's survey two-thirds of the respondents indicated that they intend to develop or improve the use of computers in bargaining, and a substantial proportion indicate that definite plans for such applications are already on hand. Caples himself expresses "cautious optimism," and sees developments as oc-



curing primarily in the preparation for negotiations and in the interpretation and administration of contracts. In the actual bargaining process, he says, discussion turns on the assumptions—not easily quantified—that underlie the particular sets of facts presented to support a bargaining position or objective.

It is clear that unions and companies both need more efficient ways of maintaining and retrieving information about employees and of consolidating the masses of raw data which each now possesses. Vast amounts of information are also required from both parties by the Government. (The Labor-Management Reporting and Disclosure Act and the Pension Fund Disclosure Act are but two illustrations of this increased call for consolidated data.) In addition, increased information is needed for collective bargaining over more complex issues, such as health-and-welfare and retirement fund management.

Technological progress in hardware and software will tend to diminish some of the impediments referred to earlier. Parties also react to each other: The use of electronic data processing by a company in connection with bargaining will tend to spur its exploration by a union, and vice versa.

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*The European Organization for Nuclear Research (CERN). The circle of the 28-GeV proton synchrotron is in the lower right of the picture, and the similar circle in the upper left is the Intersecting Storage Rings.*





# International Laboratories and European Integration

It is well known that progress in certain fields of scientific and technological research increasingly requires a new scale of commitment: enormous pieces of apparatus, scores or even hundreds of highly-skilled personnel working together in teams, and vast expenditures of money. Under these conditions, many European nations are finding that, despite their deeply-rooted scientific traditions and considerable economic strength, the level of resources they are able to commit to research is no longer compatible with the needs of science and technology. Unwilling to abandon advanced research in fields such as high-energy physics and space exploration, however, they have found an obvious solution to the dilemma in joint action, collaboration, and, in some cases, the establishment of common facilities for research.

Upon the success of such collaboration rests much of Europe's future ability to participate at the frontiers of important scientific progress. In a larger sense, it has been suggested that the exigencies of this new situation may in fact prove to be assets: as a result of their international character, joint technological facilities are said to be unique as research environments and to represent the fulfillment (at least in theory) of the scientific ideal of universalism. More importantly, the laboratories and their parent organizations offer special opportunities to advance the cause of European integration through joint efforts in a realm where the need for such integration is evident. According to this popular "functional" theory, political cohesion between the European nations will be increased through interdependence generated by collaborative activities. Within this frame, a vanguard of "Europeanized" scientists, engineers, and administrators experienced in the international laboratories will emerge to facilitate the movement.

The several international laboratories actually established during the past 15 years have met with varying degrees of success. Three—CERN, EURATOM-ISPRA, and ESTEC—are of particular interest: they are by far the largest such ventures ever attempted, they each represent an important scientific domain, and they vary widely in the degree to which they have achieved their technical and political goals. CERN, the 13-nation European Organization for Nuclear Research founded in 1954 near Geneva, is centered about an enormous nuclear particle accelerator; and the efforts of its approximately 2,600 staff members (plus an average of 400 visit-

ing scientists and fellows) are devoted to performing and supporting basic research in the realm of particle physics. ISPRA, the largest of EURATOM's four Joint Research Centers, was transferred to the European Community by the Italian government in 1961. It claims 1,700 employees working on basic and applied research in nuclear reactor physics as well as the development and construction of several prototype reactors and a broad range of work in related areas. ESTEC, established in Noordwijk, Holland by the European Space Research Organization (ESRO) as its Technology Center in 1963, has 500 staff members responsible for design and integration of satellite and sounding rocket payloads as well as for applied research in various fields of space science.

It should be clear, even from the very brief descriptions above, that despite the fact that they are all *international*, the three laboratories differ in many important respects. CERN, as a result of its well-defined mission, the remoteness of its product from practical application, the high calibre of its scientific leadership, and the confidence placed in it by its member states, has proved to be a highly successful venture; and its technical achievement is reflected in the attitudes and morale of its staff. In contrast, ESTEC has only begun to demonstrate its full technical capabilities. It was at first the victim of poor organizational design (later largely corrected through an internal reorganization) and squabbling among the member states over financial matters. ISPRA is in rather desperate straits caused by the continuing inability of the EURATOM nations to agree on a future program of research for EURATOM as a whole. In contrast to CERN and ESTEC, which sometimes offer career appointments but prefer to give short-term (three-year) contracts to their employees (in order to permit more scientists to participate in their activities), ISPRA, as part of the European Community, provides *fonctionnaire* status for its staff.

This article reports on an interview and questionnaire study of the attitudes of scientists employed at these three laboratories—attitudes toward their multi-national colleagues, their work, the laboratories' management, and in general the prospects for European integration and international scientific collaboration. The results provided information from which may be drawn some useful conclusions about the future of international laboratories as a means of European collaboration.

Assembling the 12,000 litre Gargamelle liquid bubble chamber, which is largely a French contribution to CERN.

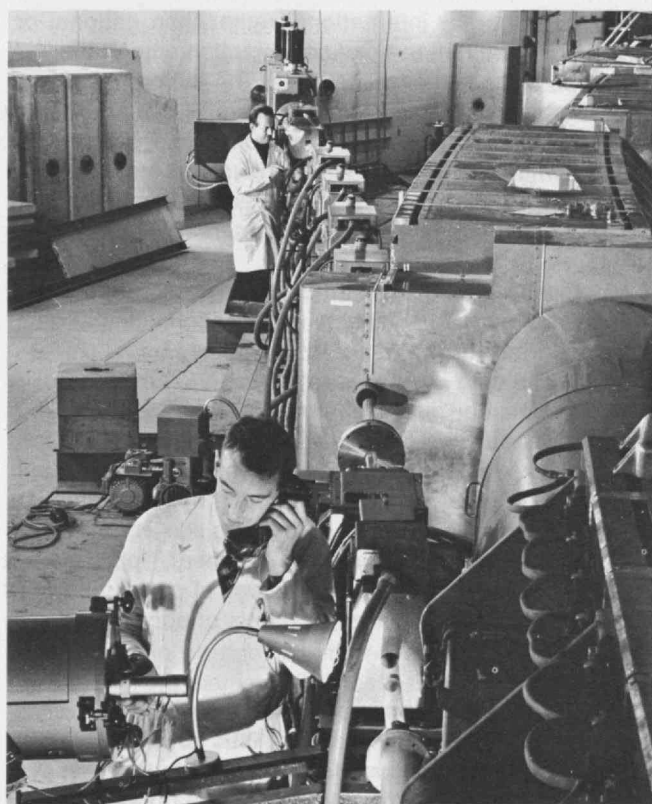
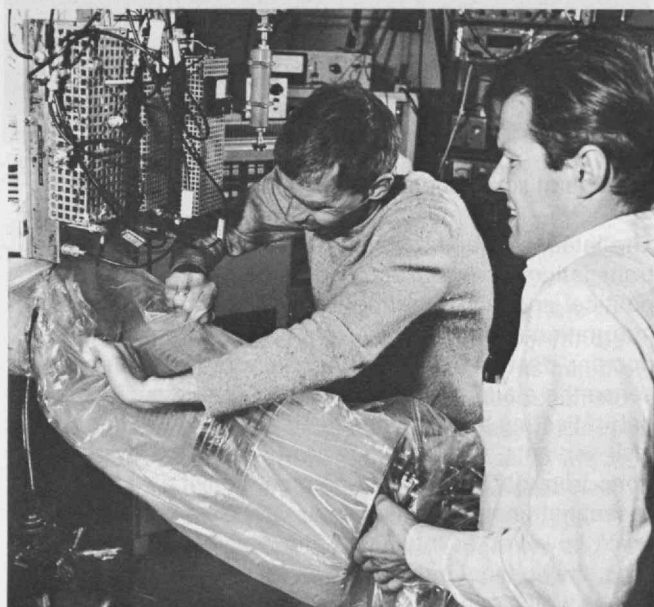
At CERN, all computing is in Fortran. This is the CDC 3100, whose role is subsidiary to the main complex (CDC 6600 and 6500).

International collaboration at the personal level, between France and Switzerland, in the measurement of one of the modes of decay of the kaon.



Scientists from Italy and France preparing a helium-cooled target for a polarized-proton experiment.

Extraction of a proton beam from the synchrotron for neutrino experiments.



At CERN, the reactions of scientists and engineers toward the special characteristics of their environment were expressed in terms of expansiveness, freedom, and affluence. The magnitude of CERN's staff as well as its budget, its unique equipment, and the independence from national administrative practice inherent in its international status all facilitate the performance of research. While some of these benefits accrue as well to the staffs of ISPRA and ESTEC, their perceived value is more than offset by, to quote one scientist, "the fantastic administrative mess you have in these organizations." Asked to give their overall evaluations of the international situation in their laboratories, ESTEC and ISPRA scientists responded most often in terms of bureaucratic and political barriers to effective research.

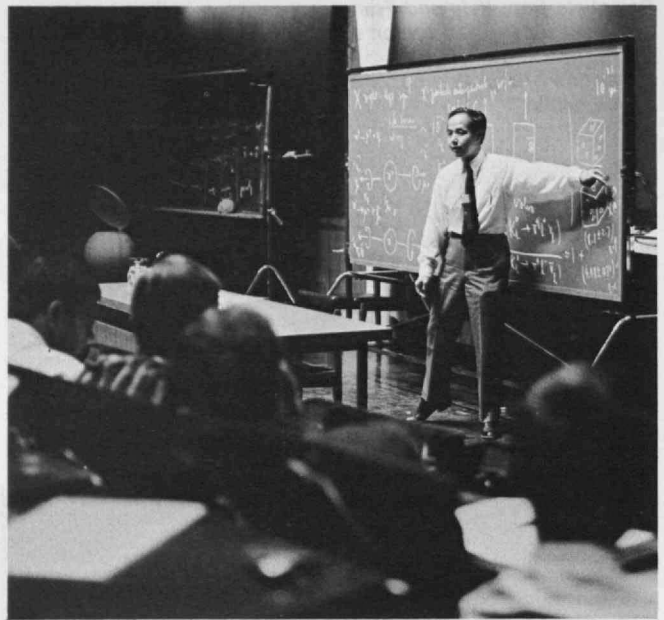
Because of their organization's relative youth, most ESTEC personnel saw their problems as unfortunate concomitants of a "running-in" period and looked with hope towards the future. In contrast, resignation and a sense of impotence governed the attitudes of ISPRA scientists—a feeling that whatever technical success is achieved at the laboratory is more or less irrelevant to its future.

While the morale at each of the laboratories was conditioned most strongly by the particular state of its program and hence is different at each center, the purely *international* aspect of the professional experience produces a range of sentiments broadly shared across all three centers. First of all, it was readily apparent that conflicts drawn on national lines are almost totally absent among the scientific and technical staffs of the three laboratories. Many of the scientists were proud to report that tendencies to coalesce on the basis of nationality did not appear. Although the conflicts that were reported in the laboratories generally took the form of clashes of personality, disputes between groups or divisions, or arguments between technical personnel and administrators, one national group was not pitted against another. This is perhaps not really so surprising: because of the integrated structure of the organizations, *interests* in internal disputes are likely to be distributed according to position and not nationality. Further, simply because friction between national groups was an *anticipated*—and potentially inflammable—problem area, people took pains to assure that it did not become involved where there was a chance that it might.

#### **Internationalism: Assets and Liabilities**

In the absence of nationality-based conflict, the scientists find both assets and liabilities in the internationalism of their laboratories. Most important among the liabilities is the inefficiency of communication which results from the juxtaposition of different languages and national styles. While much of the content and method of science is independent of cultural and linguistic barriers, it is naive to expect scientists raised and educated in different countries to think and act quite alike. The words of an ISPRA physicist, with broad experience in cross-cultural contact, make this clear: "The thing that is different is the way different people attack a problem . . . I mean a solution is a solution—but how you get to the solution, this depends on your background, your cultural and national background."





Language is only a minor problem for most groups of scientists; since the average scientist has a working knowledge of three or four tongues. Variation in national styles of scientific work, based on differences in education as well as differences in "temperament," are more serious. They make life more complicated—but also more interesting. As there is no domination by a single "native" group in the laboratories, the forms of accommodation reached by multinational groups are often unique. Each individual must learn to accept the idiosyncracies of the other—idiosyncracies based of course on personality as well as national background—and each must modify his own behavior pattern.

On the other hand, if national differences in approach make it more difficult to operate in a teamwork situation, they also are credited with making the operation a more creative one. Objective measures on this question are extremely difficult to obtain, but among scientists of all nationalities at ESTEC, ISPRA, and CERN, there was strong agreement on the value of cross-national diversity in a scientific team.

Beyond technical considerations, most of the scientists seem to derive considerable personal reward from the international situation. Work experience in an international environment is credited with a vague "broadening" effect similar to that derived from travel. An Italian physicist from CERN typified this reaction: "If we had the same CERN in Italy staffed wholly with Italians I'd perhaps do the same physics or the same mathematics and I'd enjoy these things professionally. But I would miss this contact with other people who have other kinds of education, other ideas in their heads, other prejudices than mine."

A majority of the scientists interviewed claimed to view the traditions and customs as well as the problems and policies of their own countries in a new light as a result of their international exposure. A prominent French physicist expressed this feeling succinctly: "I learned that France is not the center of the world!"

### Internationalism and the Political Environment

The development of new perspectives bears examination in light of the *political* outlooks of the scientists. After all, if one is interested in the role which these organizations may play in the future political development of Europe, the political atmospheres of the laboratories

must be of some concern.

The interviews and questionnaires suggest that a deep transnational consensus governs opinions on European political and social matters among the staffs of these international laboratories. This finding is an important one and deserves some further elaboration. In one sense the staffs of these international bodies are apolitical: reflecting their privileged status as international civil servants, the scientists are constrained by regulations from participating in political activities which represent national or partisan interests. On a personal level, however, as intelligent and sensitive human beings, they cannot help taking an interest in the great issues which confront men and states.

Politics—generally international rather than national or local—is a frequent topic of conversation among the scientific staffs in the laboratories, and the points of view expressed in these informal discussions are usually articulate and considered. At the same time, scientists are not willing to become deeply involved emotionally in particular questions or sides of questions; one observes a sort of "intellectualized detachment."

Support for the existing joint European institutions was so universal among scientists of all nationalities at all three laboratories that it could very easily be taken for granted. Building on this base, the survey uncovered widespread enthusiasm (approximately 90 per cent in favor) for expansion of the six EURATOM nations to include other Western European nations and for eventual political integration of Europe. These hopes for building Europe appear to stem from a desire to see Europe regain its position as a "leading continent," phrased not only in terms of industrial/technological competition but in terms of more generalized aspects of social and political life.

Their questionnaire and interview responses, however, revealed that the scientists are realistic about the chances of substantial progress toward integrating Europe in the near future; it was apparent that their at-

titudes are not shaped by wild idealism but rather by pragmatism—a realistic yet hopeful appraisal of the desirable and the possible.

Comparisons with studies of opinion among national European leaders in non-scientific fields (business, government, communications, trade unions, etc.) suggest that the scientists in these laboratories differ mainly in the intensity of their desire for closer integration and in the breadth of their consensus on the future shape of Europe. One portion of the survey was designed to test the hypothesis that the Europeanist orientation grows stronger as the scientist remains in the laboratory. This effect, which might be viewed as a political by-product of the laboratory, was thought to come about through the scientist's socialization into the organization's aims, reinforced by his positive personal experience in working closely with scientists of other nationalities. So strong was the consensus on Europeanist positions that it proved impossible to detect any variation over time, and no real "Europeanizing" effect could be found.

The various laboratories are, naturally, built on the premise of European integration—directly in the case of ISPRa, and indirectly in the cases of ESTEC and CERN. Scientists, moreover, are reputed to share internationalist political sentiments stemming from the nature of science itself. It should not come as much of a surprise, therefore, that the opinions of the scientists at these laboratories strongly favor increasing European integration. What is surprising is the degree to which such opinions are shared across all the laboratories and nationalities, the degree to which they appear independent of organizational morale, and the degree to which they remain constant over the period of time the scientists spend in the laboratories.

The data suggest that morale in the several laboratories is governed by situational factors dependent on but not inherent in the internationalism of the organizations. On the other hand, ignoring organizational difficulties, the international environment is felt by scientists to add a creative—albeit second-order—advantage to team research. It constitutes, in addition, a rewarding personal experience for most of the participants.

Although the scientists feel that international experience changes their perspective on their own country, such changes are not clearly reflected in political orientations. Basically, most of the scientists who come to the laboratories already manifest Europeanist orientations, and their international experience does not produce any major shifts in this orientation.

### **Political Cohesion a Necessity, Not an Outcome**

One is led to conclude that European international laboratories do not really serve the purpose of *building* a functional Europeanist elite among the scientific community in Europe. Whether they attempt to relate directly to the cause of European integration and, regardless of technical achievement, produce mainly frustration (as at ISPRa) or whether they minimize the political connection and succeed scientifically (as at CERN and presumably ESTEC), there is little evi-

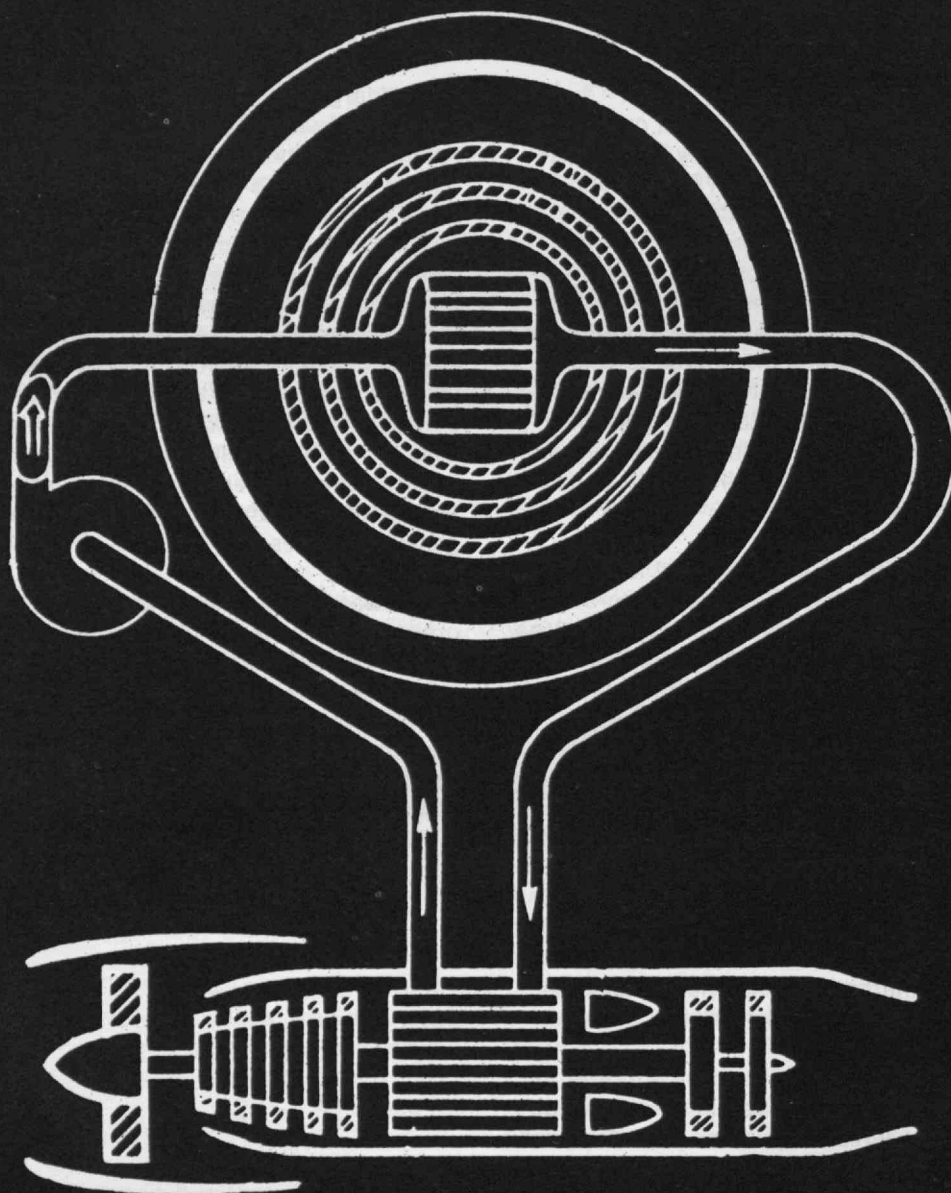
dence that the experience of working in international laboratories has a significant effect on the ideas of the scientists with regard to the future of Europe. Thus there is little likelihood of a direct effect on European integration itself.

By and large this is a reflection of the broader conclusion which many strong supporters of European technological collaboration are being forced to accept. Simply stated, it is the fact that political cohesion is more a necessary precondition for technological collaboration than an outcome of it. This is more or less the inverse of the functionalist approach. International laboratories may yield results which are eminently successful in a scientific sense without making any major contribution to the development of stronger political ties between the member nations. On the other hand, without some kind of political ties—or at least a common willingness to subordinate immediate rewards to more remote goals—large-scale collaboration in sensitive areas of science and technology is generally fruitless.

The rewarding personal experiences international laboratories may provide for scientists and the reinforcement they may supply for Europeanist political orientations are of limited potential. The tendency is to expect more political impact from this type of initiative than it is capable of producing. In terms of political results, nations will get no more out of international laboratories than they are willing to put into them.

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Figure 1. However its details are finally developed, a nuclear power plant for aircraft applications would have this general configuration: a nuclear reactor (above) surrounded by neutron and gamma shield layers in a large containment vessel, with heat transfer fluid pumped from the reactor to a heat exchange device in a conventional turbofan engine. The heated air would drive fan, turbines, and compressor.





Technically, it may be possible to make a large, long-range nuclear-powered aircraft which is economically competitive. Considerations of safety lead to some novel concepts for reactor design and control.

Frank E. Rom  
Nuclear Systems Division  
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# The Nuclear Powered Airplane

In theory, powering aircraft is an ideal use for nuclear energy. The modern airplane is a high-speed long-distance transportation system, but its range is limited, even though its fuel load typically makes up a major part of its weight. An airplane that could fly any distance on the globe without refueling would be a very important national asset. And if the device that replaces the chemical fuel weighs no more than the fuel it replaces, the payload would be at least the same as that of a chemical aircraft.

If there is a chance that nuclear aircraft would be practical, they are worth investigating. We believe that there is a reasonable chance. Studies have shown that it may be possible to make nuclear aircraft safe and practical, as long as the gross weight is higher than one million pounds. This large gross weight is needed to permit complete shielding and the incorporation of safety provisions to prevent the release of fission products even in the worst aircraft accidents.

We are now trying to determine the major obstacles to practical, safe, and economical nuclear power plants for aircraft and have a limited program of analytical and experimental work to assess the possibility of overcoming the major obstacles.

The basic concept of a nuclear power plant for aircraft use is shown in Figure 1. The reactor's heat energy travels, in a good heat-transfer fluid such as high-pressure helium or liquid metal, to an exchanger, which heats the air flowing through a conventional turbofan engine. This heat exchanger is placed immediately in front of the normal combustor. The engine can then run on conventional fuel, or nuclear energy, or both.

As in Figure 2 shielding against gamma radiation is provided by several layers of heavy-metal material like tungsten, lead, or depleted uranium; shielding against neutrons by layers of hydrogen-bearing materials that alternate with the gamma-shielding layers (we use water, but chemical fuel, other organic materials, or metallic hydrides can be used if there is any advantage). A containment vessel is provided, designed to prevent the release of fission products in the event of accidents (in previous work on nuclear aircraft powerplants this feature was never considered). As a function of the aircraft's gross weight, that of the shield—the largest single component—varies only slightly, so the larger

the aircraft the more attractive nuclear power becomes.

To be practical, safe, and publicly acceptable, a nuclear aircraft must meet the following requirements:

1. It must have a shield that reduces dose levels to allowable values in all directions around the reactor, allowing complete freedom of movement to the flight crew, passengers, and ground crew in and around the aircraft in flight or on the ground.
2. There must be no release of radioactivity in normal operations.
3. The possibility of release of radioactivity in any accident situation must be brought well within tolerable levels (a criterion familiar enough in the context of nuclear power stations).
4. Reactor refueling must be infrequent because it will probably be a relatively complex operation. A suggested time between refuelings might be 5,000-10,000 h., which is about the time between major overhauls of current chemical aircraft powerplants.
5. It must have worthwhile performance. The payload fraction should be of the order of 15 per cent of the gross weight or better at speeds and altitudes of interest.
6. The overall cost of operation must be at least comparable to that of conventional chemical airplanes.

Let us now discuss these requirements in more detail, and try to place them in proper perspective, in the light of the work at Lewis Research Center.

## Safety in Normal Flight

The allowable dose level for the general population is 0.25 millirem per hour. In our studies we design for this dose rate at 30 ft. from the reactor center-line. At further distances from the reactor the dose rate falls approximately as the inverse square of the distance.

How much does this dose rate cost in terms of shield weight? For uranium-water shields, the answer is shown in Figure 3. The shield weight increases at a rate less than the square root of the reactor power. For reactors in the power range of 200 to 400 MW the shield weights vary from about 250,000 to 350,000 lb. These are typical of the powers and shield weights for aircraft in the range of gross weights from one to two million pounds. Shield weights are thus of the order of 15 to 25 per cent—which appears to be acceptable—provided the air-

craft's gross weight is greater than one million pounds.

Of course, a reduction of the shield weight would allow increases in payload and is worth working for, but the important point is that the necessity for shielding does not prevent the nuclear aircraft from being feasible.

To be practical and publicly acceptable the aircraft should not, in normal operation, release radioactivity or produce radioactivity in the atmosphere. This is a ground rule that we have adopted in our studies, and its main consequence is that the heat transfer fluid that removes the heat from the reactor must be in a closed circuit—we cannot pass engine air directly through the reactor.

### Accidents: The Problem

Accidental release of radioactivity due to any kind of failure must be made so improbable that the potential advantages of the nuclear aircraft will outweigh the risk. As an illustration, the risk we are willing to take from the thousands of chemical aircraft that fly overhead every day is worth the advantage that comes from their use. We know that the consequences of a single accident, particularly a crash in a populated area, are severe and will become much worse as the sizes of aircraft increase. Yet, because the frequency of such accidents is so very low, we accept the risk in exchange for the benefits received.

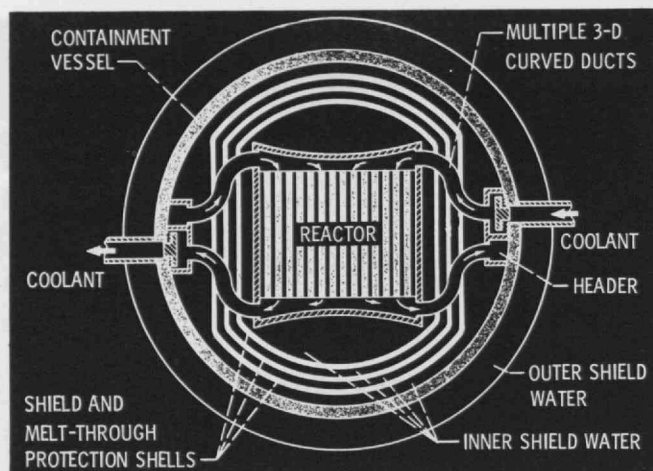
In the case of nuclear aircraft, let us assume the worst accident we can. This would be a crash into a populated area followed by a sudden release of all the fission products in the reactor. A million-pound nuclear aircraft operating for 10,000 hours would build up an inventory of about 200 pounds of radioactive fission products. If this amount of fission products were suddenly released without warning in a populated area, it is conceivable that thousands of people would receive very serious doses of radiation. To be publicly acceptable for flight over populated areas, the simultaneous probability of a crash and the sudden release of all the fission products must be vanishingly small. The alternative is to restrict the flights to non-populated areas.

Choosing useful flight paths that avoid populated areas may not be so difficult. The flight paths could be mainly over water, for example. In this case, there is an additional feature that further reduces the hazard associated with a water crash even if the containment vessel is ruptured. Because of the scrubbing action of the water, only the fission gases that are inert, such as xenon and krypton, escape to the atmosphere.

It may be that the simplest way to gain experience with nuclear aircraft is to restrict them initially to overwater flight. Coupling the facts that most of the earth is water-covered and that the range of nuclear aircraft is unlimited, it may not be difficult to find many useful applications.

The prevention of the release of fission products in the event of a major aircraft accident on land is a tough technical problem. We are concerned first with preventing the rupture of the reactor's containment vessel on

Figure 2. Schematic drawing of an aircraft nuclear reactor with its radiation shields



impact, and secondly with preventing it from being melted through by the "afterheat" that is generated as the radioactive fission products decay. These are major areas that we have been investigating, and we shall take them in turn.

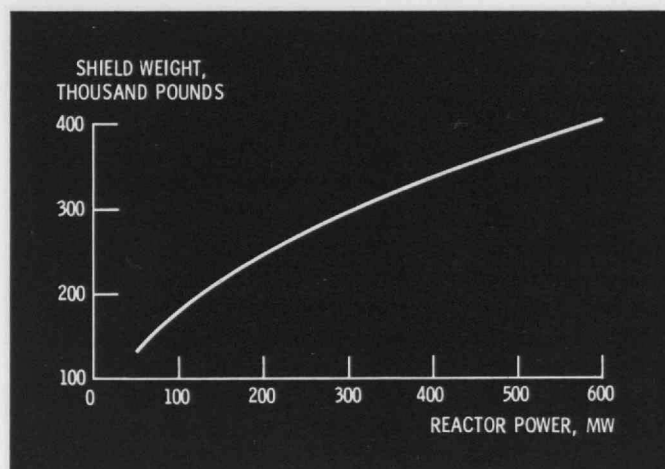
### Surviving Impact

To prevent the release of fission products in the event of a major aircraft accident, the containment vessel must survive an impact without rupturing. In addition, provisions must be made to seal off all the coolant lines and other penetrations through this containment vessel. The sealing valves must remain intact during the impact.

The reactor vessel has a certain amount of kinetic energy when it hits the earth. If no special provisions are made, this kinetic energy is absorbed by deformation of the containment vessel or of the ground—and if the impact is on granite most of the energy would have to be absorbed by deformation of the containment vessel and parts associated with it. For impact velocities greater than 100 ft./sec., some means for absorbing the kinetic energy must be added (and in any case we must keep the deceleration of the containment vessel within certain limits).

We have examined the techniques that have been considered for landing instrument payloads on the moon and planets in our space program. The three most promising methods for absorbing kinetic energy are the crushing of balsa wood, the deformation of frangible

Figure 3. Assuming that the reactor has a power density of 3.5 MW/cu. ft., and that radiation must be reduced to 0.25 millirem/h. at 30 ft. from its center, this is how the weight of shielding varies with power. High powers are favored.



tubes, and the crushing of honeycombs of metal or plastic (Figure 4). Balsa wood can absorb approximately 20,000 ft.-lb. of energy per pound, frangible tubes may be able to absorb about 80,000 ft.-lb. per pound, and honeycombs over 100,000 ft.-lb. per pound.

To date, the only method that we have had time to consider in some detail is frangible tubes. This, we find, requires the equivalent of at least 15 energy absorbers, each of which is capable of absorbing the entire kinetic energy of the containment vessel. In order to provide protection for a 300 ft./sec. impact from any direction, a shield-and-reactor package weighing 250,000 lbs. would need about 90,000 lbs. of energy absorber—a weight penalty of 35 per cent.

Preliminary estimates for the honeycomb method indicate that the weight penalty might be reduced to 10 per cent of the reactor-shield assembly weight for the same velocity. For an impact velocity of 500 ft./sec., a honeycomb system would add about 36 per cent to the shield weight. Energy absorption for impact above 500 ft./sec. is probably not possible, at least for the techniques that have been considered, although certain promising modifications have still to be explored.

This leads us to the important conclusion that a nuclear aircraft must have a collision-avoidance system aboard to ensure that flight speeds at impact do not exceed 300 to 500 ft./sec. This system must continuously monitor all trajectories that the aircraft could possibly adopt in any accident situation. It would then warn the pilot that he

must take some corrective action (a change in the flight speed of the aircraft, a change in its altitude or direction of flight, for example). If he does not, or if he does and the possibility of an accident is still not reduced, the collision avoidance system would automatically shut down the reactor and switch the engine over to chemical operation.

At the same time the airplane would be slowed down. If impact did occur, it would then be within the capability of the energy absorbing system to safely decelerate the containment vessel without a rupture. At impact, quick-acting valves are closed automatically, completely sealing up the reactor and its fission products within the containment shell.

The reactor core itself is designed so that it cannot go critical during impact. The reactor may be designed strong enough so that it will not tear loose and break up (with a danger of a core compaction that could cause a nuclear power excursion). To make the possibility of a nuclear excursion extremely remote, we have been considering thermal reactors that use water as the moderator. Whenever the collision avoidance system automatically shuts down the reactor, the moderator is drained, as in a normal shut-down.

### Surviving Without Coolant

A characteristic of a nuclear reactor is that the fission products continue to emit energy even when the reactor is shut down. This energy is known as afterheat. For the first day, typical afterheat powers would be in the range of 1 to 5 MW for aircraft of 1 to 2 million pounds gross weight.

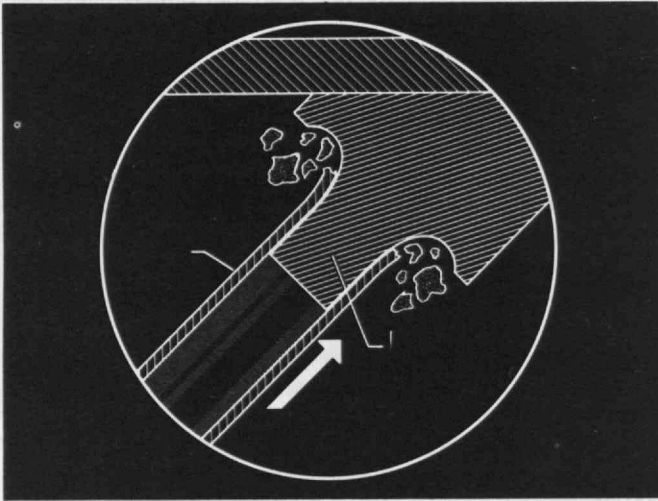
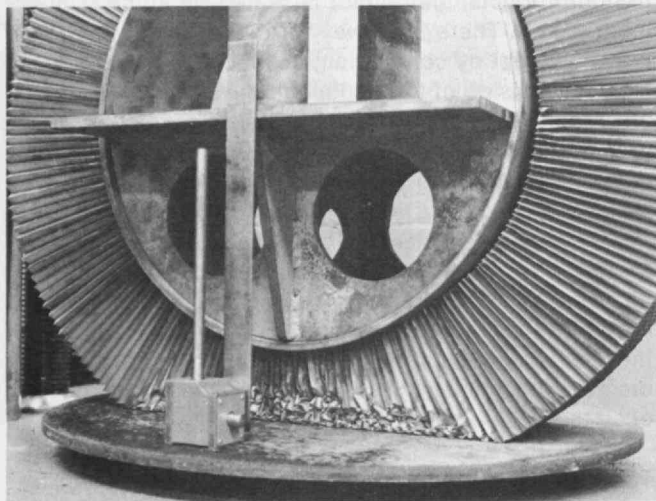
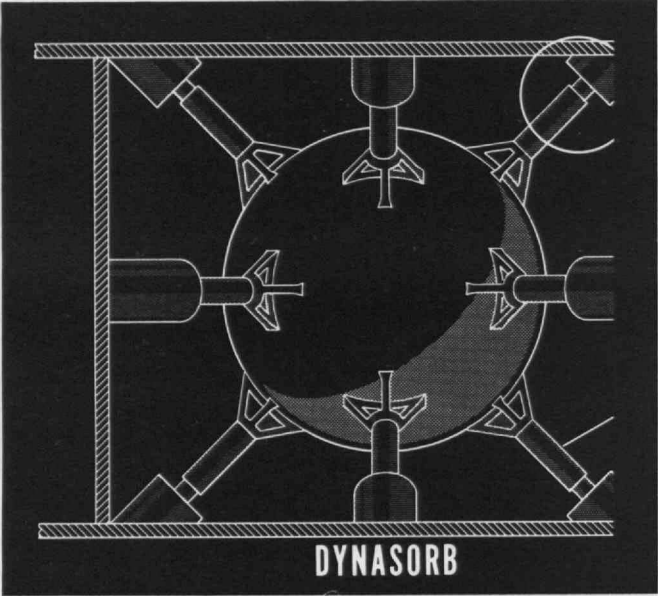
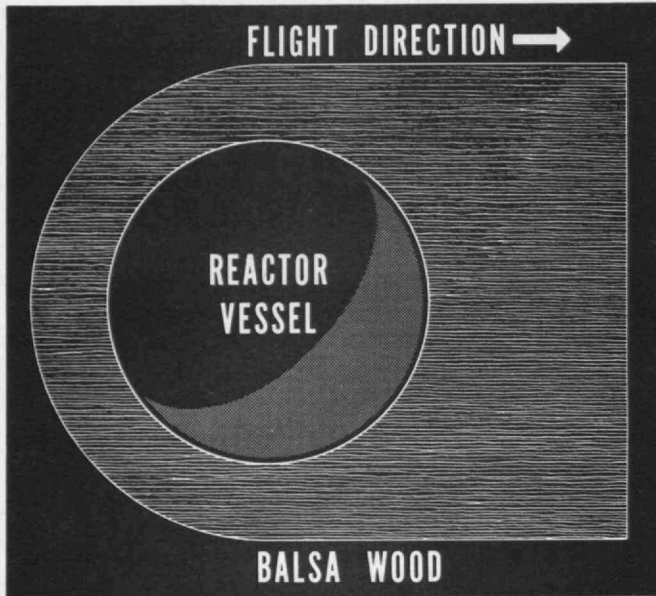
In a major accident, it is assumed, all cooling systems are destroyed. In addition, to prevent the release of fission products, the reactor is sealed off in the containment vessel. There is no way for the afterheat to be removed except by conduction, convection, or radiation from the outside of the containment vessel to whatever environment the containment vessel finds itself in. If it is in air, the containment vessel must be about 12 feet in diameter for the afterheat to be removed without the surface exceeding a temperature of 1400° F (in the high-pressure helium system for which this number was calculated, this peak temperature occurs about one hour after shutdown). If the vessel is submerged in water following the accident, on the other hand, then as long as the containment vessel is larger than six or seven feet in diameter, the maximum surface temperature will not exceed the boiling point of water.

The calculations behind these results assume that the water has been removed from inside the containment vessel before impact (so that the pressure buildup inside the vessel is not too great), and that the heat flow from the surface of the containment vessel is everywhere the same. The implication of the latter assumption is that the heat-generating fission products are distributed with approximate spherical symmetry within the core.

This is to be contrasted to a more usual assumption in reactor safety analyses, that the failed reactor contains



Figure 4. Methods for absorbing kinetic energy during a crash: balsa wood, crushable plastic or metal honeycomb, and the "dynasorb" frangible-tube system, one element of which is shown circled.



the fission products in a molten lump. The penalty that is paid in conventional power-reactor practice for such an assumption has evidently not been sufficient to warrant extensive studies of what actually happens when a reactor melts down.

But in considering the aircraft reactor, if we are to provide containment after impact we must carefully consider what really goes on when a reactor core melts down due to the loss of normal cooling—a very complicated undertaking, because the fission products produce hundreds of compounds with each other and with the materials of which the core is fabricated. Some of the fission products are gaseous, others are liquids and solids with a wide range of vapor pressures.

A general picture of what might happen in a real reactor meltdown can be qualitatively given. The uranium dioxide fuel within the reactor is contained in fuel pins that are thick-walled tubes about half an inch in diameter. In a helium reactor they might be made of refractory materials like columbium or molybdenum. Clusters of these pins, perhaps 20 or 30, constitute fuel elements. The reactor core may contain a few hundred of these elements. Each of the elements is located in a tube that connects a top and bottom header plate. The space outside the tubes is filled with water moderator.

The helium flows down these tubes in the spaces between fuel pins. It enters the containment vessel through the quick-acting seal valve referred to previously, enters a circumferential header located on the inside surface of the containment vessel, and is led to the reactor upper plenum by many small ducts, curved in three dimensions to prevent the streaming of neutron and gamma radiation from the core region. The hot helium is collected in the bottom plenum, is ducted to a circumferential header in the same manner, and exits through a quick-closing seal valve.

Gamma shielding is provided by multiple layers of heavy material, like uranium or tungsten, and neutron shielding by layers of water that fill all the gaps between the reactor vessel, gamma shields, and containment vessel. The gamma shield material is designed to provide protection against melt-through, as follows.

When the coolant ceases to flow, the temperature of fuel elements rises. About 1/4 of the energy generated is in the form of gamma radiation, which heats up the surrounding materials, and the remainder of the heat appears *in situ*. As the temperature rises, heat is removed from the fuel elements by radiation and conduction to the structural material of the core. The fuel pins become weaker and burst due to the pressure of the fission gases within them. The fission gases, about 1/4 to 1/3 of the fission products, diffuse uniformly throughout the void spaces in the containment shell.

The fuel pins continue to rise in temperature; more and more of the fission products are vaporized, leave the pins, and condense on cooler surfaces. This happens to some of the uranium dioxide itself.

As the temperature continues to rise, portions of some

of the fuel pins melt. The drippings fall down to colder surfaces where they solidify. As more of these drippings collect, the heat generated in them becomes significant, and they remelt and form pools. Volatile fission-product compounds leave the pool and recondense on cooler surfaces.

The surfaces that were originally cool begin to heat up, due to the heat generated in the condensed fission products. Volatile fission products tend to condense further toward the outer regions of the containment vessel. In the meantime the pool of drippings receives more and more molten fuel-pin materials. The shell that was holding this pool now also heats up and fails, allowing the pool to dribble through to the next shell. The heat generation rate of the molten pool, per unit volume, is now less than it was in the beginning because the decay heat is reduced with time and because many of the more volatile fission-product compounds have evaporated and recondensed elsewhere.

If the design is correct, the fission products end up in a very nearly uniform distribution with approximate spherical symmetry, and not all the shells will melt through.

We have just begun the task of finding and assimilating all the data pertinent to this problem. There are interesting fuel melt-down experiments going on at Oak Ridge and other locations which should give some help. Because of the complex nature of this problem, analysis with a high degree of confidence will probably not be possible. Carefully thought out experiments will be needed to provide the insight necessary to formulate analytical models and procedures for predicting the performance of real systems. We have not yet done much work in this area, although our designs incorporate our best guesses as to how to prevent the containment vessel melting through.

So far I have not mentioned the possibility that critical masses could be formed in pools in various voids within the containment vessel. We have made a study of this problem for a thermal reactor system similar to that shown in Figure 2. If the total uranium investment is kept under 1,000 pounds and if the reactor moderator and shield water are removed, it is not possible to achieve critical geometries for any of the molten pools we could envision. Further study is required to try to accomplish the same goal for fast reactors.

An interesting result of limiting the total uranium in the core for safety reasons to 1,000 pounds is that we need to achieve a very high level of burnup (the proportion of the fuel that actually undergoes fission). Inasmuch as 200 pounds of uranium are consumed in 10,000 hours of operation, the average fuel burnup must be 20 per cent. This means peak burnups of the order of 30 per cent. The highest burnups for commercial reactors are in the range of 1 to 3 per cent. We are asking for an order of magnitude increase.

A fuel pin concept which can provide such high burnups has been worked out, as we shall see. But for the moment, the important point is that, in aircraft reactors,

Figure 5. A fuel pin designed for very high burn-up. The fuel is on the inside surface of a cylinder which is able to retain all fission products. At hot spots, it vaporizes to condense in cooler regions.

high-burnup fuel is required to prevent accidental criticality—not simply, as one might have thought at first glance, to increase the power-to-weight ratio.

### How Long Between Fuel Changes?

Because of the relatively complex operation required to refuel a nuclear reactor, the time between refueling should be as long as possible. Conventional chemical engines require a major overhaul about every 5,000 to 10,000 h. A reasonable goal might be that the time between reactor refuelings should be in the same range. In addition, all other powerplant components—heat exchangers, pumps, piping, valves, and auxiliary systems—should have lives comparable with those of chemical engines.

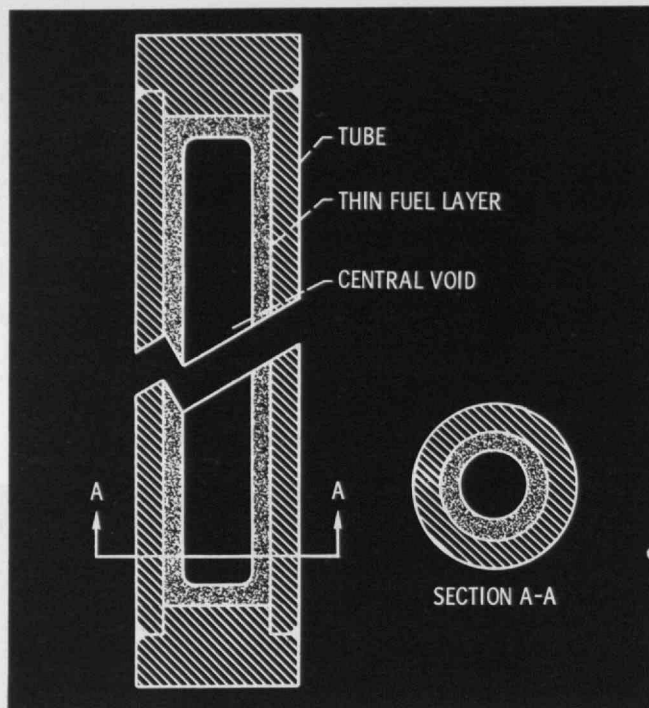
Given this lifetime, we need a high-burnup fuel for the sake of a safely low initial fuel inventory, as we have seen. Also, the less fuel, the less the core volume, minimizing shield weight.

Until recently, a 20 per cent average burnup in fuel pins was thought to be virtually impossible. There is a major effort under way to achieve the equivalent of 10 per cent burnup which is required to make commercial fast breeder reactors economical, but this goal has been achieved only in isolated tests.

The Lewis Research Center has proposed the use of a fuel pin concept which can achieve 20 per cent burnup or higher. The pin (Figure 5) consists of a tube that is designed as a pressure vessel. Fuel is in the form of a layer, thin relative to the thickness of the tube.

The objective is to ensure that the fuel material is weak compared to the clad, so that when it swells due to the buildup of fission products within it, it will flow plastically into the central void without introducing a major stress in the clad material.

The void also provides room for the gaseous fission products to expand—it is designed large enough so that at the desired burnup level the fission-gas pressure can be held by the clad-tube. We are currently carrying out in-pile experiments in the Plum Brook Reactor to verify the concept for aircraft use. The experiments are being conducted at the pressure levels, temperatures, power densities, heat fluxes, and neutron fluxes that would be characteristic of aircraft reactors. We expect the pins to



perform as predicted, because they use ordinary design principles and conservative assumptions. L. R. Blake, in England, has tested fuel pins of this type which verified the basic principles.

At the end of the element's life we only have 80 per cent of the fuel left that we started with. In addition there has been a buildup of "poison" fission products (neutron absorbers). Continuous and adequate control of such a reactor, and the ability to restart it at any time after shutdown, raise problems which we are now solving.

The solution involves new control concepts, not only because of the large reactivity that must be controlled but because we cannot use conventional rod control systems due to the large volume they tend to require. The reactors we are concerned with are compact in order to minimize the shielding. We could not afford to increase the shielded volume by the factors of two, three or four necessary for conventional control systems. We are therefore considering reactor control systems that are quite out of the ordinary.

If the fuel pin is designed so that the inside surface of the fuel (uranium dioxide) reaches a temperature of 4,000° to 5,000° F., a very interesting and important phenomenon occurs. At these temperatures the  $\text{UO}_2$  has a relatively high vapor pressure. If for any reason the fuel surface temperature in one area is higher than in another area (for example, due to poor local heat transfer), the fuel will vaporize from this hot zone and recondense on the cold region. Hot spots will thus tend to be relieved.

In most reactors the highest rate of fuel burnup occurs in the center of the core where the neutron flux is highest. This means that uranium is being depleted at a greater rate in the center than at the ends of the core. The heat generation rate then tends to be reduced in the center of the core, and hence the surface tempera-



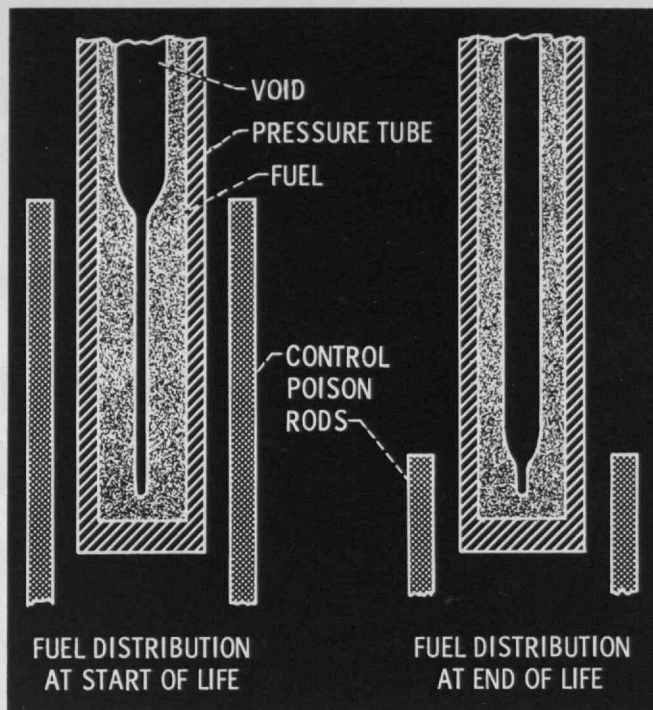


Figure 6. Using the pressure-cylinder type of fuel pin, control can be effected by the movement of a neutron absorber to create cool regions into which much of the fuel migrates.

ture of the fuel will be reduced. This means that fuel will be transferred as vapor from the cool ends of the pin toward the center. Now, the fuel is worth more in terms of reactivity in the center of the core than at the ends. The core life will therefore be increased, because fuel from the region where it is not worth as much is automatically transported to where it is worth more in reactivity. The overall change in reactivity during the life time of the reactor is thus reduced, simplifying the control problem.

It is possible to take further advantage of fuel vapor transport and use it for reactor control. We could, for example, blanket off one end of the core with a neutron absorber. This would produce a large cold no-power zone at the end of each pin. The reactor fuel would tend to condense and form a solid mass of  $\text{UO}_2$  in this end of the pin (Figure 6). As fuel is burned up in the remainder of the reactor, the neutron absorber could gradually be withdrawn to expose some of the fresh uranium to the neutron flux. This fresh uranium would then redistribute in the remainder of the pin that is generating heat.

The reactor, in effect, would have a reservoir of unused uranium that can be called into play as the rest of the fuel is used. The vapor transport feature of this fuel pin concept allows reactor control with much less mechanical movement during a given reactor life.

In an aircraft nuclear system such as the one in Figure 1, the turbine inlet temperature is limited by the heat exchanger material, which therefore must be oxidation-resistant and strong at high temperatures. The most suitable available material we have found so far is an alloy known as N-155, a ductile material that can be welded, worked, and machined readily and which allows operation of high pressure helium-to-air heat exchanger tubes at temperatures in the order of 1,500 to 1,600° F. We have also done experiments on header configura-

tions. One header-and-tube-section, designed to operate for 1,500 hours at 1,550° F., actually ran for more than 5,000 hours before it failed.

It remains to be shown, however, that whole heat exchangers or representative sections of a heat exchanger will perform reliably for the life times we predict when exposed to the complete environment of an airplane. This involves investigation of thermal cycling, vibration, and thermal expansion problems.

With our limited effort we have not been able to do much work in many areas that would require attention if nuclear airplanes were taken seriously. These areas include pumping systems for high-pressure inert gases, seals for these systems, valves, piping required to duct high-pressure high-temperature gases from the reactor to and from the engines, and auxiliary systems such as for afterheat cooling. The air breathing portion of the system requires studies of the problems involved in extending the shaft lengths of turbofan engines so that a heat exchanger can be incorporated.

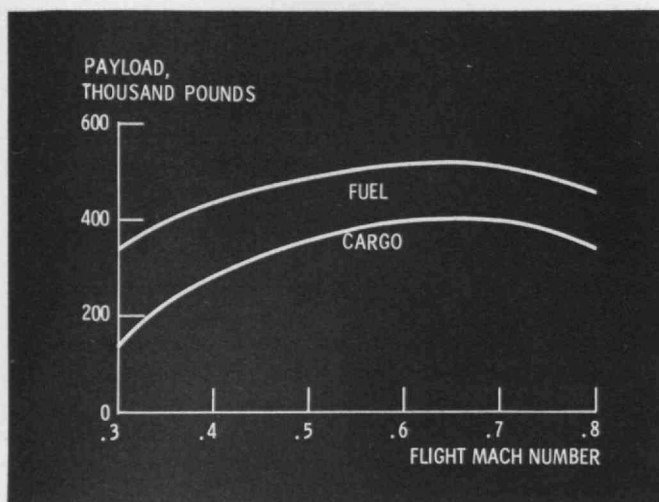
An experimental program is required to determine the feasibility of fast-acting valves that are necessary to seal off coolant lines and other penetrations into the containment vessel during a major aircraft accident.

### Performance and Cost

Figure 7 shows the payload anticipated for a nuclear aircraft with a gross weight of 1.75 million pounds. The payload (cargo and chemical fuel) is plotted as a function of flight Mach number for an altitude of 36,089 feet. Chemical fuel has been provided in this case for takeoff and landing and for one hour flying time at design flight conditions. The payload is in the vicinity of 500,000 pounds for Mach numbers of 0.5 to 0.75. The fuel load is about 120,000 pounds in this range, so that the cargo capacity is about 400,000 pounds. This amounts to better than 20 per cent of the gross weight.

Figure 8 shows the corresponding weight breakdown as a function of flight Mach number. The largest single block of weight is the structure, which is in the range of 0.42 to 0.45 of the gross weight for Mach numbers of 0.5 to 0.8. An important penalty was that the cargo space was provided with a flat floor supported only at the sides. Depending on the application, the structure weight could be appreciably reduced. If the structure

Figure 7. Variation of payload with flight Mach number for a nuclear aircraft weighing 1.75 million lb. and flying at 36,000 ft.



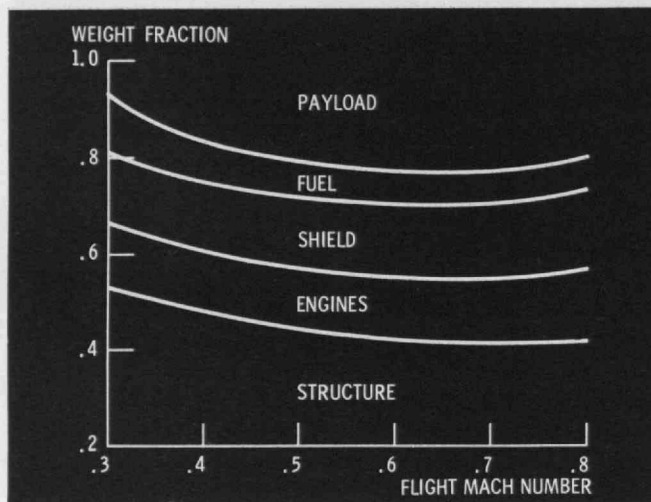
could be reduced to 30 per cent of the gross weight, for example, the payload could be increased by more than 200,000 pounds.

The shield constitutes only 15 per cent of the gross weight. The shield and chemical fuel together would constitute about 20 per cent, and another 7 per cent or so can be attributed to items of weight that would not be present on a chemical aircraft. Thus, if this were a chemical aircraft it would have a fuel capacity of about 27 per cent. The range for such an aircraft would be about 6,000 miles. In terms of cargo carrying capacity this would be the break-even range for nuclear and chemical aircraft—for greater flight distances the nuclear aircraft would carry more payload.

Although it is beyond the scope of this study to perform a cost analysis, it is possible to show that a potential exists for nuclear aircraft to be more economical than chemical aircraft. The basic cost of the heat energy for chemical and nuclear fuel (93 per cent enriched uranium-235) can be compared. The heating value for nuclear fuel in terms of Btu per dollar is six times higher than for chemical fuel. Assuming an aircraft life time of 60,000 flying hours, the fuel cost for a 1.75-million-pound aircraft is 52 million dollars, compared to 9 million dollars for the nuclear.

The difference, 43 million dollars, can be considered to be available for manufacturing the reactor, reprocessing the fuel to recover the unused uranium-235, and any

Figure 8. Fractional breakdown of the total loaded weight of the same aircraft.



other charges that result because nuclear energy is used. If this total cost is less than the difference in the cost of fuel consumed during the life of the aircraft, nuclear aircraft would then be more economical than chemical aircraft. The important point is that there is a distinct possibility of this being so.

#### Suggested Readings

"Will the Nuclear-Powered Aircraft be Safe?," Frank E. Rom and Patrick M. Finnegan, *Aeronautics and Astronautics*, March 1968

"Nuclear Propulsion for Aircraft," John M. Wild, *ibid.*

"Very-high-burnup Vapor-transport Fuel-pin concept for Long-life Nuclear Reactors," Frank E. Rom, Patrick M. Finnegan, and Glen E. McDonald, N.A.S.A. TN D-4860, October 1968.

Frank E. Rom, Chief of the Advanced Nuclear Concepts Branch of N.A.S.A.'s Lewis Research Center, joined N.A.S.A.'s predecessor—the National Advisory Committee for Aeronautics—as an aeronautical research scientist in 1948. He has conducted analyses of possible nuclear versions of the various kinds of aero-engine, including ramjets. His current areas of study include gas-core nuclear rockets and nuclear air-cushion vehicles for mass transport. This article is based on a state-of-the-art paper presented to the Fifth Propulsion Joint Specialist Conference of the American Institute of Aeronautics and Astronautics in June at the U.S. Air Force Academy, Colorado.

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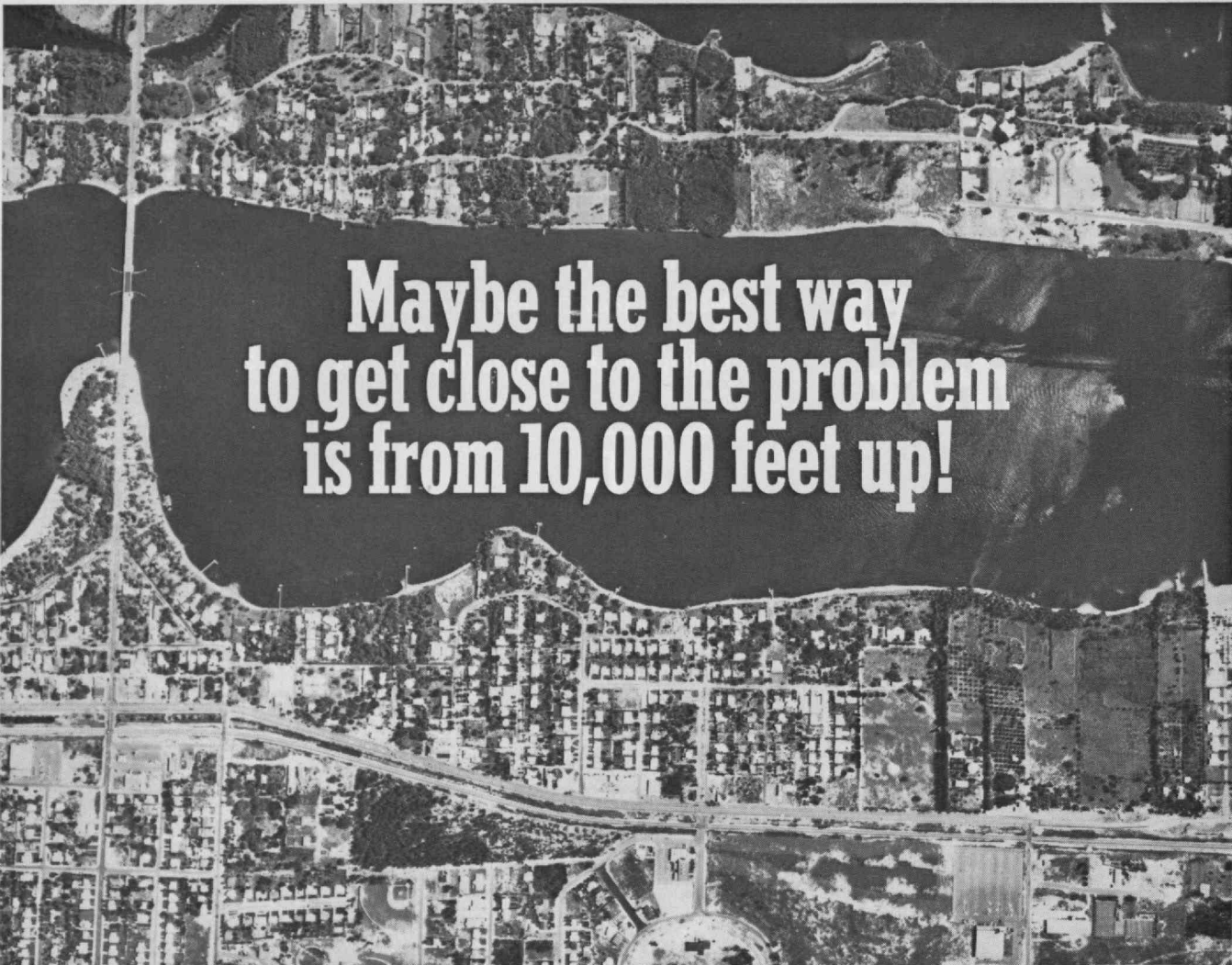
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# Trend of Affairs

## "... He Could Have Won a Nobel Prize"

"I got the news in the strangest way: I was putting away the breakfast dishes when a neighbor called. I said, 'Ridiculous.' " Dr. Salvador E. Luria, professor of biology at M.I.T., had just won the 1969 Nobel Prize in medicine.

The Nobel citation commends Dr. Luria for his work with the "replication mechanisms and genetic structures of viruses." As he describes it, "The work started in a trolley car in Rome in 1938. There was a traffic interruption, and I began talking to a microbiologist who looked familiar. He was studying bacteriophages" (viruses which attack bacteria and use the cell material to produce hundreds of viruses) "and two weeks later I was working with him. In the early 1940's I joined Dr. Max Delbruck, and, together with Dr. Albert Hershey, we studied the whole process of viral reproduction in cells, attempting to break it down to individual steps and to put it on a precise quantitative basis. We also studied the ways in which different viruses in cells interact with one another."

Dr. Delbruck, of the California Institute of Technology, and Dr. Hershey, of the Carnegie Institution of Washington, share the Nobel Prize with Dr. Luria.

"The work we did was one of the roots of molecular biology," he continued. "Practically all of the advances in virus research in the last 20 years are derived from the work of Delbruck, Hershey, myself, and our many students. The study of viruses is useful as a model of how the molecules of genes function in the cell—how they produce the properties of the cell." James Watson was one of Dr. Luria's students, and this viral work was requisite for his and Dr. Crick's DNA model.

Dr. Luria's special area has been genetic mutations in viruses—he was the first to find such a mutation—and the mutations in viruses and bacteria which make a resistant cell vulnerable to viral attack. He is currently working on the specific mechanisms by which molecules of bacterial DNA are broken or interfered with during a viral infection. For much of his work, he was awarded, with Delbruck, the 1969 Louisa Gross Horwitz Prize for outstanding research in biology by Columbia University.

"An impressive array of bottles has already arrived from friends and colleagues," he commented. And he has immediate, spontaneous plans for part of his \$25,000 share of the prize: support of a number of anti-war organizations. "I have been very strongly involved in the protest movement against the Vietnam war," he said. "If this had happened yesterday, you would not have found me. Yesterday was the Moratorium, and in the morning I was talking with legislators at the Statehouse. In the afternoon, I listened to the M.I.T. convocation and marched on Battle Green in my home, Lexington, where Governor Sargent spoke against the war."

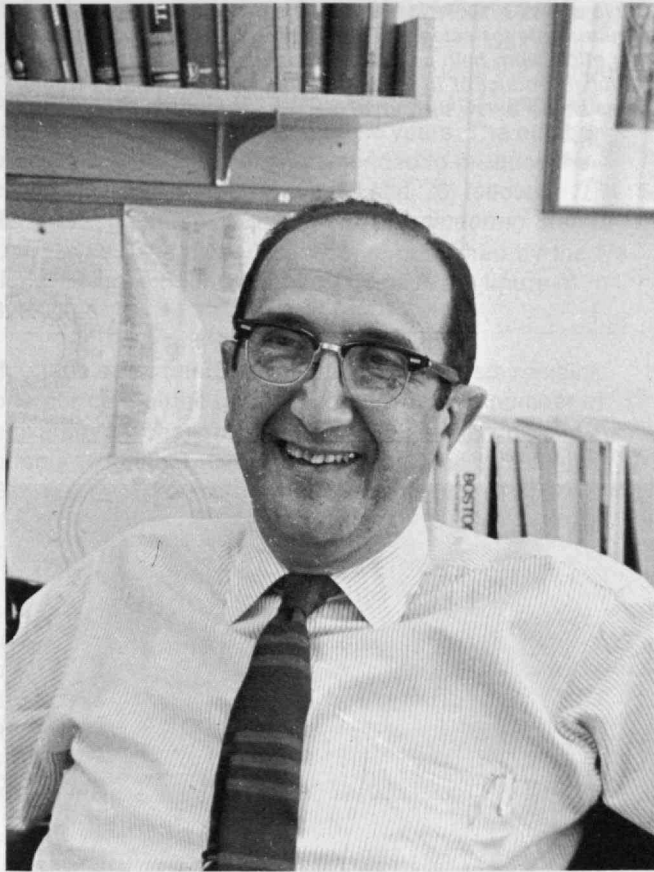
For the past two years, Dr. Luria has been chairman of the Boston Area Faculty Group on Public Issues. "I think that if a number of recommendations by academic and other groups had been followed, we would have avoided the embarrassing and desperate situation we now have in Vietnam." He talked about the decline of funds for medical research: "There is an enormous disproportion in our priorities. This country does not need such over-swollen military programs. It interferes with every good cause into which we should put our energies—research, poverty, refurbishing our urban ghettos and the substandard housing in the country."

Dr. Luria has an equally strong concern for the dangers of technology for which there are yet no societal controls. Genetic surgery, changing the hereditary material in cells, may soon be possible. "This may be a great boon for the treatment of certain diseases," he said, "but there are very serious dangers that this kind of knowledge may be misapplied or applied with no clear understanding of its implications. Who decides what are good genes and bad genes, what are good people and bad people?" Dr. Luria published an article in the October 20 issue of *The Nation* describing his concern.

Dr. Luria was born in Turin, Italy, in 1912, and received his M.D. from the university there in 1935. He worked at the Curie Laboratory of the Institute of Radium in Paris in the late 1930's. He came to the United States in 1940. He worked at Columbia University, Indiana University, the University of Illinois, and at Vanderbilt and Princeton Universities as a Guggenheim Fellow. He joined the M.I.T. faculty in 1959, and he is now the Sedgwick Professor of Biology and head of microbiology.

The *New York Times* describes Dr. Luria as a "devoted





Salvador E. Luria, Sedgwick Professor of Biology in his M.I.T. office. Writing in *Science* for October 24, Gunther Stent of the Harvard Medical School's Department of Neurobiology says the 1969 Nobel Prize for Physiology or Medicine honors three men who, 30 years ago, "began to transform the landscape of classical Mendelian genetics into the latter-day 'molecular' Crick-Watsonian scene. . . . The birth of bacterial genetics," he writes, "can be dated as of 1943, when Luria and Delbruck published a joint paper in which they showed that the appearance of phage-resistant variants in cultures of phage-sensitive bacteria represents the selection of spontaneous bacterial mutants. . . . With their paper Luria and Delbruck did for bacterial genetics what Mendel had done for general genetics—namely, showed for the first time what kind of experimental arrangements, what kind of data analysis, and, above all, what kind of sophistication is needed for obtaining meaningful and unambiguous results." (Photo: Janet Kreiling)

teacher and a trusted confidant who has a social conscience and a mad sense of humor." He looked slightly uncomfortable in the presence of 12 or 15 cameras and relaxed when he could begin to speak. He studied sculpture in Paris, and works rather well in wood and metal. He likes long walks with his wife in the New England autumn. His wife, Zella, is an associate professor of psychology at Tufts; his son Daniel, is a senior in economics at the University of Rochester. And how did his wife take the news? "I assume she was pleased."

He ended the press conference: "I am looking forward now to going to teach my 11:00 class and resuming a sort of normal life." A few months ago, one of his students said that if Dr. Luria were less a teacher and if he spent less time with his students he could have won a Nobel Prize.

## Systems Engineering Versus Real Progress

"If I plot a graph versus time of what appears to be a recent rising tide of costs, cost overruns, unsatisfactory performance, and unhappiness among engineers, I have reason to worry. If I plot on the same graph versus time the rise in talk, directives, and use of 'systems engineering,' 'systems analysis,' and 'Management,' I see a high correlation between the two graphs." Thus begins Robert A. Frosch, Assistant Secretary of the Navy, in a paper in *IEEE Spectrum* (September, 1969, pp. 24-28).

"I believe that the fundamental difficulty is that we have

all become so entranced with the technique that we think entirely in terms of procedures, systems, milestone charts, PERT diagrams, reliability systems, configuration management, maintainability groups, and the other minor paper tools of the 'systems engineer' and manager." Frosch compares the sort of systems management that he observes going on today to the behavior of a music student "who writes a concerto by consulting a checklist of the characteristics of the concerto form, being careful to see that all the canons of the form are observed, but having no flair for the subject."

Frosch contrasts the real world with the procedures and practices that have become fashionable in recent years, in a series of antitheses:

Paper versus people—"in most cases where a system is about to get into trouble, a competent manager knows all about the problem and is well on his way to fixing it before his management systems ever indicate that it is about to happen. . . . personal contact is faster than form-filling and the U.S. mails. A project manager who spends his time in his Management Information Center instead of roving through the places where the work is being done is always headed for catastrophe."

Linearity versus non-linearity—The practice of breaking down a problem into sub-problems, the separate solutions of which are then combined, frequently fails because the real world is highly non-linear, and "the interaction terms may be as large as the sub-problems." The objection that without such subdivision many problems are unmanageable is compared by Frosch to the thinking of "the man who played in a poker game that he knew to be crooked, because it was the only game in town."

Serial versus iterative models of development—Tools such as the PERT diagram constrain managers into thinking of projects in terms of "step A, then step B, then step C," whereas "Anyone who has ever carried out a development or a design (as opposed to setting up a management system for doing so) is well aware of the fact that the real world proceeds by a kind of feedback iterative process that looks more like a helix than like a line. . . . I have seen overruns in expenditure and unnecessary effort generated by the fact that the linear sequencing of milestones had forced development of a complete maintenance and reliability plan for what was

no longer the design, and had not been the design for three months."

The above by no means exhausts Frosch's criticisms of current practice, but all have in common the distinction between life in the real world and the limited set of possibilities that are taken into account in the approved forms of "systems thinking." He is particularly concerned with the tendency to pretend a greater knowledge of the future—one's own or the enemy's—than is actually possible.

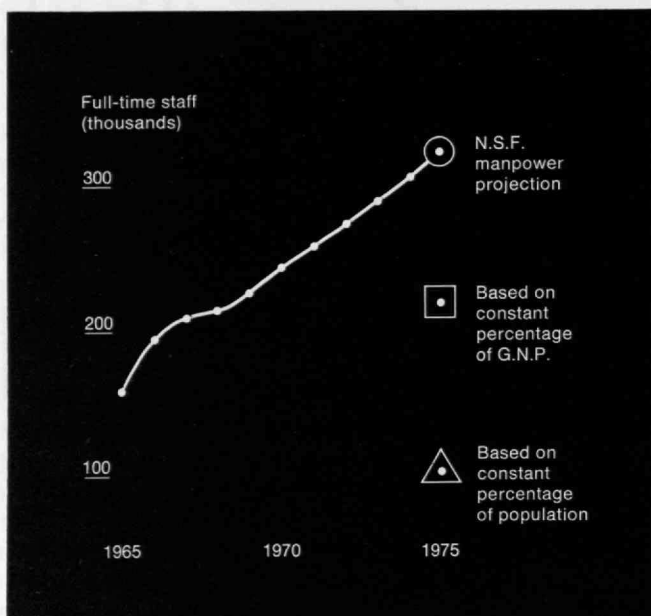
What he proposes is simple, although perhaps rather rare: "The only thing I know that works is to obtain a competent man and his assistants, and make sure they understand the problem—not the specifications of the problem, not the particular scenario written down, but what is really in the minds of those who have a requirement to be solved. Then give them funds, a good choice of managerial and system engineering tools, and let them work at it with reasonably frequent conferences with those who have the requirement."

Among his closing observations is the following: "From time to time I am briefed on the results of a systems analysis or systems engineering job in a way that prompts me to ask the questions: 'That's fine, but is it a good system? Do you like it? Is it harmonious? Is it an elegant solution to a real problem?' For an answer I usually get a blank stare and a facial expression that suggests I have just said something really obscene."

## Is Science Reaching A Steady State?

The proportion of the U.S. population engaged in science (including teaching, R and D, and their administration) has increased from less than 0.5 per cent to about 1.0 per cent since 1940. The proportion of the gross national product devoted to R and D doubled between 1953 and 1963. Although no part of a society can continue indefinitely to grow at a faster rate than the society itself, current predictions of scientific manpower and funding requirements generally rely on some kind of extrapolation of recent rates of change. What will happen

Curve shows a 1967 National Science Foundation forecast of requirements for science staff in universities. If the total scientific effort were held constant in relation either to the Gross National Product or to the population, the 1975 figures would be as shown below the curve.



when the growth of the research establishment levels off?

Joseph P. Martino, Assistant for Research Analysis at the Holloman Air Force Base Office of Research Analyses in New Mexico, attempts to show how a transition to equilibrium conditions would affect the requirement for university science faculty members in 1975, if the transition occurred now (*Science*, Vol. 165, pp. 769-772). He considers two forms of equilibrium—constant manpower as a percentage of the U.S. population and constant R and D funding as a percentage of the GNP—and he shows that science faculties would be dramatically smaller than is generally predicted, particularly in the former case.

Martino's reasoning begins with an equation expressing changes in the total number of scientists due to two sources of gain—new graduates, and non-graduates entering science—and two "sinks"—movement from science to other fields, and death or retirement. The relationship between new graduates and university teachers, and the necessary figures for solving the equation, are available from published statistics.

Assuming that the GNP continues to grow as it has for the past 15 years, that R and D expenditures continue

to be three per cent of the GNP, and that \$41,000 per year is the cost of R and D per scientist, including all overheads (a 1965 figure), Martino deduces the number of R and D scientists for 1975 and 1976, and hence the total numbers of scientists in these years. The number of university science teachers needed to produce the calculated increase, between '75 and '76, follows: 222,000. The study of *Science and Engineering Staff in Universities and Colleges, 1965-75* published by the National Science Foundation in 1967 gave the figure of 325,000.

If, on the other hand, the number of scientists remains one per cent of the nation's population, the number of university teachers required to produce them comes out at only 101,000 in 1975—less than half the 1967 figure. Since the requirement for teachers is governed by the rate of change of the scientific population, a nearly constant scientific manpower implies very few teachers.

Martino examines some of the consequences. First, if university faculties cease to grow at anything like their present rate, a reduced proportion of the nation's scientific research will be done in universities: so "new funding mechanisms will be required to pay for that research which will no longer be required in support of teaching."

The age distribution of the scientific community, which is at present heavily weighted towards youth, would in an equilibrium situation be very like that of the population at large. "To the extent that creativity is associated with youth, the result will be a decline in average creativity." Another thing that will decline is the speed of promotion.

If, as seems likely, those who are interested in science will continue to take degree courses in it, in about the present numbers, the employment prospects for the holder of a given qualification may also decline: those without doctorates may "be unable to obtain employment at other than the lowest levels." (For an account of what looks like the beginnings of such a situation, see "British Scientists: Other Side of The Coin," by Brian J. Ford, *Technology Review*, July/August, 1969, pp. 16-17.)

Many other changes are likely, says Martino; he has examined only those to be expected in universities. "Because of the deep-rooted nature of the assumption of non-equilibrium growth, many of these modifications may not even be apparent until the situation has reached the crisis stage."

However, the projection given is intended to show the worst that can happen, and "the situation in 1975 cannot help but be better than the foregoing computations show if any forethought at all is used in developing U.S. science policy." The point is that the transition to equilibrium must henceforth be taken seriously.

## On the Importance of Being Nourished

"Mandatory fortification of staple foods is a national responsibility and a moral imperative." Other voices conflict: "But you have no proof that it does any good." "But we need machinery and schools." "Build up the rest of the economy and people will get enough to eat."

The first view was strongly voiced at the International Conference on Amino Acid Fortification of Protein Foods held in September at M.I.T. It sounds simple enough, and would be, if nutrition were not so intimately involved with the total human and economic health of a nation. The mechanics of fortification can be discussed, and were, but only in close connection with the economic and social patterns of a particular country. Perhaps the first step in improving nutrition is the understanding by planners that it is basic to national growth. Nutritionists must therefore concentrate on delineating this connection.

At the conference, the connection was delineated rather sternly. Malnutrition reduces the physical capability of the worker. It kills young people after money has been invested in their growth and before they can become productive. By reducing a man's mental capabilities—this has not been conclusively proven but seems probable—it slows down the whole creative process needed for a country's evolution. Indirectly it affects birth rates: in India, the same percentage of children born live to age five as live to sixty-five here. A mother must bear more than six children to ensure that one male will survive to her old age. The birth rate should go down if more children can survive. Malnutrition is their greatest killer.

Babies are born the same size the world over. They grow at the same rate for six months. Then the differences become visible: Japanese children born in Japan and raised in the United States are taller than Japanese children born and raised in Japan. Children of the lower class in the United States are shorter than children of the middle and upper classes. Yet it is believed that 90 per cent of the children born in the world have the same genetic potential for growth.



# The Plot, or the Tea, Thickens

Tea is a pleasant social drink, with many traditions and no food value. In India, as in many countries, it is consumed by almost all persons, regardless of social class, religion, economic standing, education, or geography. Because of this simple attribute, tea might become the single most concentrated source of protein in the average Indian's diet.

Fortification of tea was one of the ideas presented at the International Conference on Amino Acid Fortification of Protein Foods held at M.I.T. in September. The conference, presented by the Department of Nutrition and Food Science at M.I.T. and the Joint Malnutrition Panels of the U.S.-Japan Cooperative Medical Science Program, brought together new research and approaches to the international problem of protein malnutrition.

One of the questions raised was, how do you get people to eat whatever is developed? Or, as one of the participants phrased it, "What do people actually eat?" Different foods are consumed by different social and economic classes; religious taboos also limit an individual's choice. That a food is available only in certain areas is another limitation, for India lacks the cultural uniformity and commercial interconnections of the United States; and the existing industrial structures, or the lack of them, must also be taken into account. The fortification of wheat, for example, will not reach the people most needing it, because each poor household grinds its own, and fortification must be done in central processing plants.

Fortification of wheat with the amino acid lysine is sometimes suggested as a good method for India, where wheat is a staple food. But wheat proves unsatisfactory. Not only is it ground locally, but Hindus in India do not eat bread, and neither do infants—and infancy may be the period most vulnerable to nutritional deficiencies.

The question begins with what people are now eating, and with finding technology to improve those foods that can be handled through processing plants. Tea seems to offer a possible answer. It solves the problem of losing added nutrients in the cooking water, because tea is its cooking water. Salt is another possibility: it is produced in only two locations and is eaten by all social classes the year round. Indeed, it appears to be used in greatest amounts by those who are most malnourished.

The basic technology for adding amino acids to tea and salt and other simple processed foods exists, but conference speakers emphasized that many practical problems still need research before such fortification could be instituted on a national scale.

Nutrition does not automatically improve, however, when the general standard of living improves. There seems to be a slight decrease in the quality of nutrition when small amounts of money become available to the very poor: faced with a choice for perhaps the first time, their money is often spent on ball point pens and radios, or on aesthetically pleasing foods less nutritious than those eaten out of necessity. A family chooses polished white rice rather than rough brown rice. And economic growth does not always reach the lowest income groups. Its distribution is skewed. It only reinforces their plight and makes them relatively poorer. Estimates are that even with an ideal distribution of increased wealth, at least two or three generations would grow up before diets would be improved thereby.

What sounded simple now becomes complex. Nutrition must improve at a rate greater than a country's general economic growth, although that rate must also be faster than at present. Nutritionists must fight not only for better diets but also for general development. They must build cases for the importance of nutrition; they must educate both nations and individuals; they must make clear the need for re-ordered priorities. (One speaker pointed out that the United States currently spends \$87 billion on arms and defense and only \$1 billion on food aid.)

Yet the urgency of hungry people must contend for lean dollars with the urgencies for heavy machinery, for arms, for education, for agricultural equipment, for exportable goods. Too often nutrition is seen as a welfare problem rather than a developmental one. Another difficulty is that nutrition is so interrelated with other aspects of health—disease epidemiology, personal attitudes, sanitation—that specific gains from improved foods are perhaps impossible to substantiate. Nevertheless, several speakers felt that, since such gains are so probable and can be generally seen, fortification ought to be effected without conclusive proof.

Support evolved at the conference for strong national nutrition programs. Two prerequisites were defined: a national policy for fortification, adequately funded and designed to be permanent, and a cadre of planners to interpret and implement its decisions.

# From Fire, Air, Earth, and Water

That foods must be fortified to correct grossly inadequate diets for many of the world's people has been established. A start has been made on the market research to make fortified foods acceptable to the consumer. One area remains to be discussed and researched: the technology of fortification. Technology was a primary subject at the International Conference on Amino Acid Fortification of Protein Foods held at M.I.T. last September.

Much work has already been done. Three basic ways of strengthening diets have emerged. One is to improve the quality of the nutrients in the crops upon which much of the world depends for food—grains such as wheat, corn, barley, rice—and to increase the quantities available. The second is the addition of whole-protein concentrates to these natural products. The third is the addition to food of separate amino acids (the building blocks of protein) to improve the amounts of protein present and to correct the balance of such acids, and to make possible the metabolism of all of the other amino acids present. There is a limiting factor in amino acid ingestion: a particular ratio of acids to each other must exist before the full quantity of each present can be accepted. Corn, for example, is limited by the amino acid lysine, and unless more lysine than occurs naturally can be added to a corn product, some of the other amino acids are wasted.

The "green revolution," the vastly increased production of grains due to new, stronger, more flexible varieties, was discussed in the March, 1969, issue of *Technology Review*. But increased production is only part of the revolution. New strains are being developed which contain more protein and a better balance of amino acids. Two good examples are opaque-2 and floury-2 corn.

The opaque-2 variety contains at least 40 per cent more lysine and about 2 per cent more overall protein than corn grown now. It should be possible to push these percentages even higher, perhaps up to 15 per cent protein in the kernel (the norm is now 8 to 9 per cent), and opaque-2 corn seems the most promising of the new strains. One study shows that its protein has 90 per cent of the value of milk protein when fed in equal amounts to small children. The genetic background of a floury-2 variety influences its protein content more strongly than does that of an opaque-2 strain, and a good, consistent floury-2 has yet to be developed, but one with lysine and total protein levels similar to opaque-2 should be possible. These strains do not yet produce as much grain per acre as the varieties now grown, although some researchers report a yield as high as 85 per cent of the current crop.

Barley is another grain in which this sort of genetic improvement seems possible. One variety, CI3947, contains 17 per cent total protein and 4.2 grams of lysine per hundred grams of protein (opaque-2 corn contains about 5.5 grams of lysine per hundred of protein),

while the common type contains 11 per cent protein and 3.6 grams of lysine per hundred grams of protein. It should also be possible, by hybridization, to increase the protein quality or quantity or both of wheat, rice, and other cereals.

The greatest advantage of these new varieties is that no processing is required—the protein is in the grain as it is harvested. The two alternative approaches add a nutrient to a food, and a commercial, centralized means of processing must be devised before they can be useful.

Concentrated whole protein can be extracted from fish, leaves or seaweed, and single-celled organisms. These concentrates, however, can change other properties of the food to which they are added besides its nutritive quality—such as taste, texture, and cooking characteristics—and these changes must also be desirable to the user. Fish protein concentrate is made by removing the fats and oils from cheap kinds of fish not usually eaten. It has one strong advantage: it is similar in protein quality to meat. Unfortunately, compared to soy (an inexpensive protein source) it is also relatively costly. Single cell protein is extracted from bacteria, yeasts, or fungi. The organisms can be grown in certain petroleum, natural gas, or possibly vegetable starch products, and this food can approach soy in cost. Leaf protein concentrate can appear in two forms: a tasteless liquid produced when leaves are pulped, or a pressed cake made by coagulating the juice. It is the cheapest concentrate, economically competitive with soy.

Fortification with individual amino acids, the third alternative, requires no change in eating habits. Amino acids do not affect the taste or other properties of foods. They can be mass-produced by fermentation or chemical synthesis, and presently range in cost from about \$2.00 per kilo to \$50.00 per kilo. These prices should decrease as the demand and production increase. A program of lysine fortification of flour in India, for example, should cost about \$1.00 per person per year for a population of 1,000,000 persons. It seems that amino acids can be added to a great variety of foods, so the choice can be dictated quite freely by a particular country's needs.

Research is being conducted on the means by which these nutrients can be added to foods which will be consumed. The previous story describes the market research involved. The economic structures—processing plants, commercial exchange such as currency—are also being investigated. Small village mills to grind grains and add amino acids to them are being studied in Guatemala and Thailand. A fish processing plant in Nova Scotia produces not only fish protein concentrate but employment. Perhaps the inter-connection between nutrition and general economic health may provide the beneficial beginning of small, local industries.

# The Space Station's Problematic Doors

Six years from now, according to the National Aeronautics and Space Administration's plans, a 12-man space station is to be launched having a minimum life-time of 10 years. In succeeding years, the station is to be upgraded to accommodate 50 people. Two companies—North American Rockwell and McDonnell Douglas—have each received \$2.9 million design research contracts from N.A.S.A.

Much of the technology for the construction of such stations is already available, and at the sixth annual meeting of the American Institute of Aeronautics and Astronautics late in October, industry representatives treated most of the problems with considerable optimism.

An exception was Perry L. Gardner of Grumman Aerospace Corporation's Product Development Department, whose theme was the transfer of men and materials from shuttle vehicles to the space station. He concentrated on the later, 50-man station, partly on the ground that the earlier structures must be compatible with the later ones (a 50-man version is envisaged as being in orbit only four years after the 12-man station).

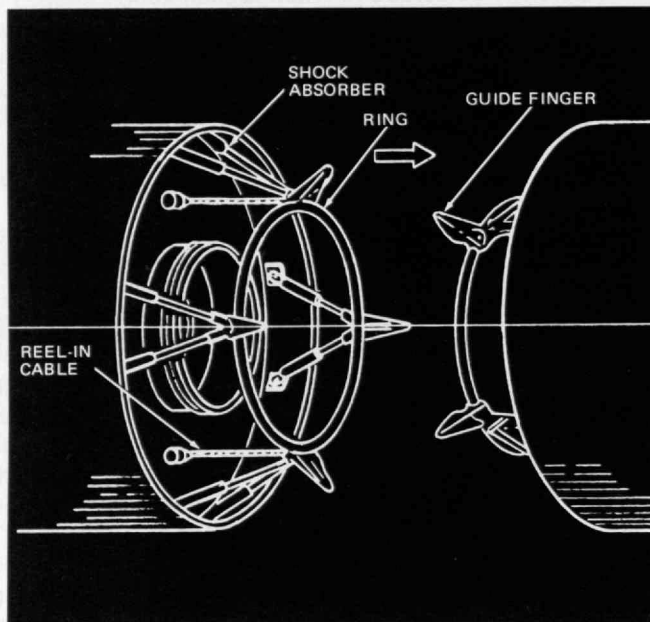
Every 90 days, in Gardner's ground rules, a 50-man crew would need to be supplied with 48,000 lb. of materiel—food, equipment, liquefied gas, and water. It should also be possible to transfer crew members who are disabled, untrained for extra-vehicular activity, and without space-suits.

As regards the transfer of men, the most critical capability is that of rescuing men without space-suits from one vehicle using another vehicle of the same kind. This implies the development of a symmetrical "shirtsleeve transfer environment" docking system whose seals and shock-absorbers will continue to function for many operations (Gardner's ground-rules for logistics systems include "200 mission cycles with minimum maintenance").

The transfer of fluids in zero gravity implies some sort of expulsion. The present solution—bladders—is unsuitable for long-term use, given the variety of fluids, each with its own compatibility problems. Gardner examines other possibilities, such as capillary transfer (which "offers hope for some applications") and rotation-induced artificial gravity; he concludes that fluids had better be transferred in tanked form, leaving the filling of the tanks to earth facilities. An alternative—since many of the liquid-transfer problems originate in the toxicity of some of the fluids—is to use water for everything, including the on-board generation of propellants by electrolysis.

The movement of solid objects within the station is a different type of task from their transfer between station and vehicle. Current practice is based on the fact that, in zero gravity, a man can move a 200-lb. load while

*Can we assure long life and reliability in docking mechanisms such as this one, using today's technology? asks Grumman's Perry L. Gardner.*



guiding himself along a rail. "However, if we consider moving even 10 tons in 200-lb. packets, we wonder whether the astronaut porters might not be more profitably employed," said Gardner; he proposes either an internal battery-powered railway or an internal satellite.

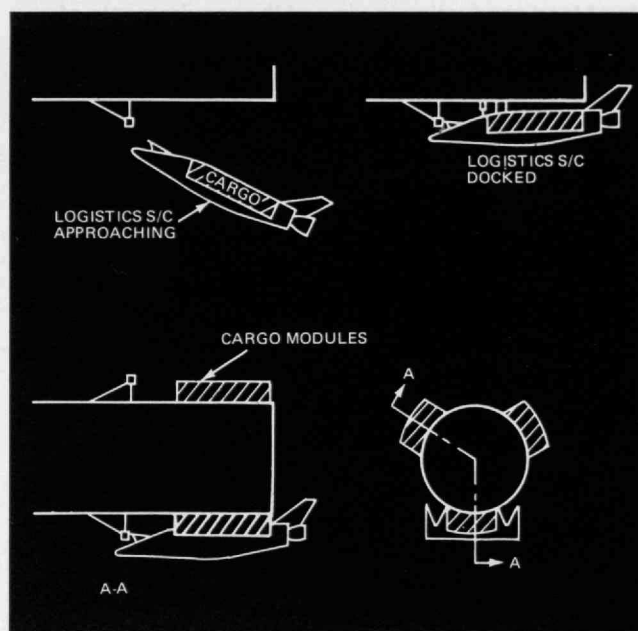
External transfer inevitably involves mechanisms which must tolerate extremes of temperature, radiation, and vacuum for long periods. Such mechanisms have not been demonstrated, and Gardner anticipates technological problems with bearings, seals, and lubricants. The use of hangars would internalize most of these mechanisms, but at the cost of an air leakage "several orders of magnitude greater than any other in the otherwise closed-loop system."

Development of long-life mechanisms for the space environment is given a high priority by this Grumman engineer—particularly docking systems, "because once a standardized mechanism is chosen, future vehicles will have to use it whether optimum or not."

It is by no means obvious where the transfer ports should be placed on the earth-to-orbit shuttles and on the space station. The shuttle's design is constrained by aerodynamic considerations and by the need for a heat-



According to Gardner, this is one of the few possible ways of docking a shuttle-craft to a space station, allowing for the engineering constraints on both. Around one extreme of the station's hub, three payloads are accommodated—one incoming, one outgoing, one in storage. The shuttle arrives nose-first, latches on to a "trapeze," and is rotated until it connects with a support. The cargo unit is ejected through the top of the craft and docked to the station.



shield over the lower surface. The space-station needs a large heat-radiation surface, unencumbered by adjacent objects and not impinged upon by vehicle exhausts; and much of the area around it must be kept clear for nuclear or line-of-sight reasons. Taken together, these restraints leave few real possibilities. The implication is that the station, the service vehicles, and the connections between them must be designed in detail as a single system to avoid serious problems a few years hence.

## Mr. Nader and the Devil's Advocate

Every profession needs its devil's advocates, said Ralph Nader at the Harvard Medical School this fall. Their role: to prod their colleagues into correcting abuses of which their profession gives them special knowledge.

The professional who chooses this role needs protection so that he can fulfill it without fear of political pressure or damage to his professional reputation. He must have financial support and be respected, said Mr. Nader. In other words, it's no picnic at best.

For medicine, an advocate is needed to focus attention on such abuses as industrial accidents, industrially-caused chronic disease, "environmental violence," and—Mr. Nader's special concern—automotive safety. Engineering needs its own advocates, too—to insure, for example, that sound engineering takes precedence over the superficialities of design. (Recent Pontiac automobiles, he said, "are really designed for warfare.")

Industrial health and safety were described by Mr. Nader as the "greatest on-going disgrace of the medical profession." There are millions of industrially-caused injuries each year, not counting long-term "silently harmful" diseases caused by exposure to dust and chemicals, he said. He censured the "almost slavish obedience of plant physicians" to their employers who frequently order them not to report injuries or to publish studies.

Until last year only one state recognized black-lung as a compensable, work-related disease, he said, yet its incidence is up 50 per cent in some areas. Three physicians in West Virginia who formed a Black-Lung Association to try for state protective legislation were vilified—not supported—by the local medical societies.

The legal profession is already defining its devil's advocates, Mr. Nader told his medical school audience; an example is the employment of 1500 lawyers by the Office of Economic Opportunity to provide legal aid to the poor.

Why doesn't medicine have its protectors? Lawyers do not have the medical profession's "almost lethal hostility" to the government, Mr. Nader said. Thus it is easier for lawyers to work with government, from which stimulus and protection for devil's advocates must come.

The pressure for change must come from inside, not from outside, a profession. To protect these mavericks from political reprisals, their skill-rights must be defined and ensured by court procedure much as property rights are now, Mr. Nader said. Financial support should be given them by a professional self-tax. In this way, he hopes, advocates would be seen as, and be, respected members of their professions, rather than outcasts and drop-outs.

Total faith in the argument one adopts as an advocate is not necessary, Mr. Nader said; all that is needed is to understand that the burden of proof of safety properly belongs with government regulators and with the sellers.

# Toward an Enduring Agriculture

The fertile lands on which we now depend have had their productivity raised considerably in recent years by advances in agronomy, and the conventional view is that any problems that arise in these areas will be solved by the addition of further nutrients. There is no guarantee, however, that present unnaturally high levels of productivity can be maintained in perpetuity, although it is generally regarded as desirable that the human race should survive indefinitely at something like its present population. In some formerly fertile areas of the world, the productivity of the land has now dropped nearly to zero.

Reasoning in this way, Dr. R. T. Coupland, Director of the University of Saskatchewan's Matador Field Station, concludes that it is important to discover what level of productivity a given piece of land can be expected to maintain in the very long term. He is leading a team which is studying native prairie—assumed to be in balance with its environment—in terms of energy flow and material transport, with the aim of constructing a quantitative model showing inputs, outputs, and internal transfer functions.

"If we could understand how the grassland system works," he says, "we might then be able to develop a crop system on a similar sustained basis." The prairie he is studying is "potentially the best quality of wheat land in the region." Nearby is a field which has been in wheat production for only 25 years. This artificial system is being investigated in the same way. Comparison between the native and artificially cultivated areas may lead to some idea of the relative stability of the latter.

The project is being financed largely by the Canadian National Research Council, and involves 100 researchers in a wide range of disciplines, from the Universities of Saskatchewan, Calgary and Manitoba, the Department of Agriculture, and the Canadian Wildlife Service. Known as the Matador Project, it has now been designated the International Center for I.B.P. Grasslands Studies. The International Biological Program (I.B.P.) has grasslands studies under way in thirty countries, one facet of a world-wide effort "to evaluate the world

rate of food production in view of the requirements of a rising population."

As regards the rise in world population, Dr. Coupland suspects that populations, in some societies at least, reflect the availability of food—so that the production of more food may simply lead to further increases in numbers, resulting in dubious net progress at the expense of even greater disturbance of natural systems. He contrasts the modern readiness to introduce artificial elements into plant ecologies with the situations of earlier settled parts of the world, where a continuing battle against natural degradation (typically, the re-growth of forest) forced the farmer into a co-operation with nature based on understanding. (An agricultural system which has remained stable for 1,000 years in Thailand, using slash-and-burn methods against forest, was reported in *Science News*, January, 1969.)

## Errors Always Retreat

Pyotr Leonidovich Kapitsa spoke in Cambridge this fall, at M.I.T. discussing his work with magnetrons and at Harvard on the education of scientists in the U.S.S.R. He was touring the United States, as a great man of science, and within the brotherhood of scientists, as a man of peace. He spoke of both.

He spoke of peace, of the terrible powers we now have to destroy ourselves. He spoke of the senselessness of the arms race, the senselessness of systems such as the A.B.M., both for his country and for that of his hosts. He spoke as a Soviet citizen, one who had once left his country, perhaps intending to stay in the West, who was once detained by Stalin, and who now could probably leave and evidently chooses to remain.

The sense of the man is that science is a human, intellectual activity, recusant of geographical boundaries. He told a Washington press conference that he hopes the United States and the Soviet Union will eventually share important work such as research on cancer or the construction of a huge particle accelerator. This he sees as part of the political convergence of the two systems which will be necessary for the survival of man on earth. He agrees with the paper published by his good friend Andrei Sakharov (see *Technology Review* for June,

His most recent work has been the development of the nigotron, a high power generator similar to a magnetron. The nigotron generates strong continuous power, whereas the magnetron emits large amounts of power in very short pulses. Dr. Kapitsa has used the nigotron for heating ionized gasses to about two million degrees centigrade.



1969) and with Hans Bethe of Cornell University and Richard Carwin of I.B.M. who argue in a recent *Scientific American* the scientific and technical futility of the A.B.M. International cooperation among scientists seems to him one way of bringing the cultures closer together, and he places this responsibility on the scientific and intellectual elites in both countries.

Dr. Kapitsa is an old man now. He is a little brusque, as one who has defined what is important and what is not. His hair is white, his face is gaunt, his eyes are quick. He probably still feels pride, as he did at 27, that his Russian belly was more competent with liquor than those of his English colleagues. He has a gentle presence of a man who has won enough of his battles.

Besides the scientific meetings, he came to the U.S. to see the Grand Canyon and Las Vegas. There is something still of the young man who wrote with ingenuous affection and surprise of Lord Rutherford's great and kind interest in his work, of the young man who called Rutherford "the Crocodile" and described his standing on a chair at a physics faculty dinner, glass in hand, shouting toasts and singing.

There is also the mature man, secure in his work, concerned with creativity in science and the arts and how

best to foster it. He has always believed in open discussion and argument, that "errors always retreat under the pressure of truths, no matter what handicaps there may be." He supported the acceptance among Soviet scientists of the theories of relativity and of cybernetics, when those theories were repudiated by the Soviet establishment.

There is the strong man who stood up to Stalin after World War II, refusing to work on the bomb, and who evidently was placed under house arrest until Stalin's death for that refusal. During the purges of the late 1930's, he refused to work until Stalin released from prison a Jewish physicist, Lev Landau, who was accused of being a Nazi. Landau later said that Kapitsa saved his life. He has supported experimental art and sculpture in the Soviet Union, once arranging an exhibition in the halls of his Institute for Problems in Physics for a young painter condemned by the Soviet bureaucracy of art.

Pyotr Kapitsa is also a great physicist. He was Lord Rutherford's favorite at the Cavendish Laboratories, offered all the laboratory space and assistance he needed, and given warm letters every two months after his forced return to Russia in 1934 until Rutherford's death. He has worked in nuclear physics, high-energy electronics, strong magnetic fields, and other areas. He liquefied helium. An Academician of the U.S.S.R. Academy of Science, he has won the highest honors of the Soviet state. He belongs to the Academies of Science in the United States, India, and Denmark, and the comparable society in France. He has won the Faraday Medal, the Franklin Medal, and the Niels Bohr International Gold Medal.

Dr. Kapitsa spoke on science: "Science is international. It belongs to all countries." "Science is creative—like literature and art, it requires creative abilities."

On education: "A real scientist must learn all his life. Our schools must teach him to learn . . . I'm not saying your educational system or ours is better—we're all trying to do the same job."

On errors: "Man must not be afraid of making mistakes, only of not realizing his mistakes."

On lectures: "Yesterday I gave a lecture, today I give a lecture, I hope I have not tomorrow to give a lecture."



# Do the Measurers Measure up?

The scientists and engineers of each generation rely on measurements of all kinds of physical and chemical properties which have been made by their predecessors. The task of critically evaluating such measurements, and providing reliable information on the properties of substances, belongs to the National Standard Reference Data System (N.S.R.D.S.), a nationwide operation co-ordinated by the National Bureau of Standards.

The task, it now appears, is more difficult than might have been expected. Depending on the field of research, the fraction of the available measurements that are really worth evaluating ranges from 25 to 75 per cent.

The N.S.R.D.S. has a second objective: to improve the quality of experimental practice in laboratories in general to and raise the standard of reporting. When the System began its work in 1963, no one knew how important this upgrading task would be. Now it "may well turn out to be equal in importance to the availability of evaluated data," according to Edward L. Brady, the Associate Director for Information Programs at N.B.S.

Speaking to the Subcommittee on Science, Research, and Development of the House Committee on Science and Astronautics earlier this year, Dr. Brady said, "I am confident that it will not come as a great shock or disillusionment to the members of this Subcommittee to learn that scientists do not always do the right thing in the laboratory, nor do they always report their work properly." He went on to give the above-mentioned range of percentages. He also cited a review of data on the ionization of atoms by electron collision, carried out at an N.B.S. center and described by Dr. L. M. Branscomb (who is now the Director of N.B.S.) in *Scientific Research* (Vol. 3, No. 11, pp. 49-56). In this field, it was found that only 10 per cent of the papers collected "contained even the most rudimentary evidence concerning the essential questions"—questions, that is, that had to be answered to decide whether the measurements meant anything. Dr. Branscomb estimated that \$45 million would be spent on producing papers in this field between 1967 and 1971.

Other fields are probably not in as bad a state as this, Dr. Brady considers, "but similar, though less serious, situations certainly exist"—for example, in infrared spectroscopy. "Criteria for infrared measurements developed at the initiation of one of our projects are now being adopted . . . all over the world."

The standard reference data effort is unusual in having revised its budget estimates downward. In 1966 the eventual annual cost of the program was put in the region of \$18 to \$20 million. The current guess is only \$12 million. The difference is due to plans for international cooperation, aided particularly by the efforts of the International Council of Scientific Unions. As well as the European countries, Japan, and Canada, the U.S.S.R. now seems likely to take part in an exchange of work.

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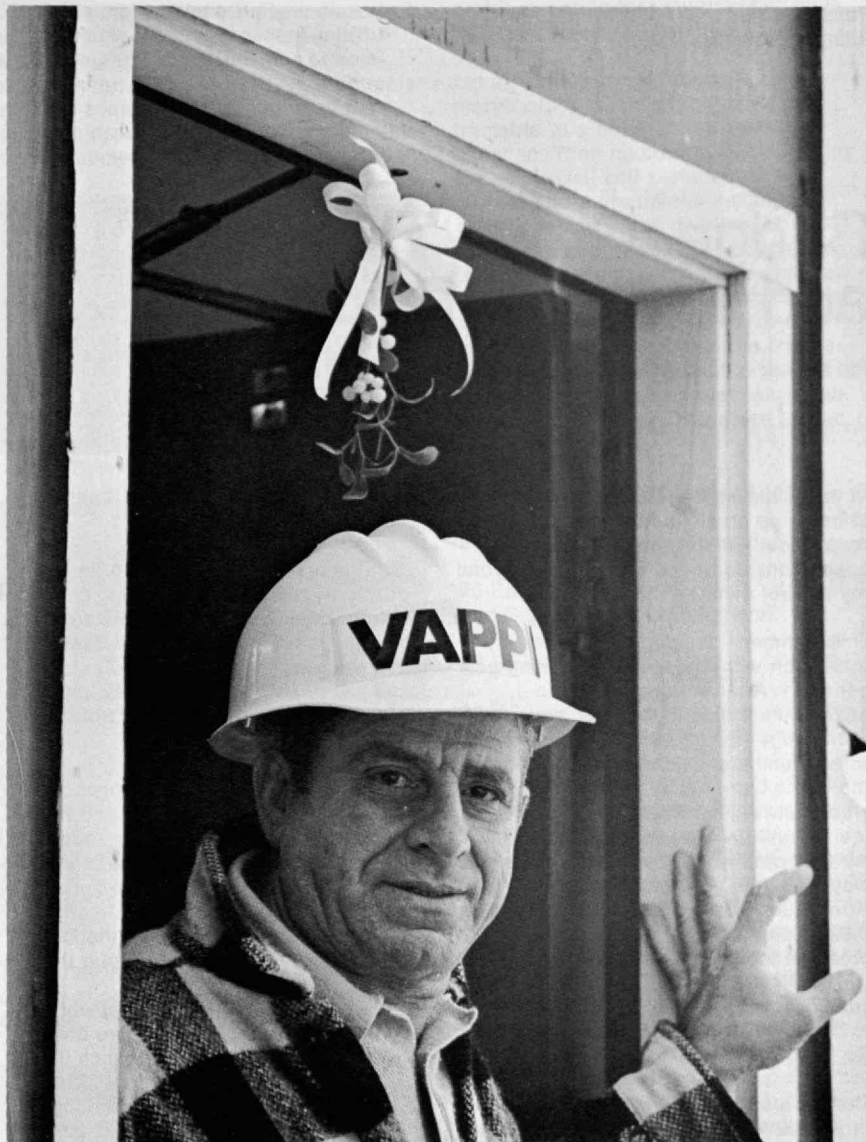
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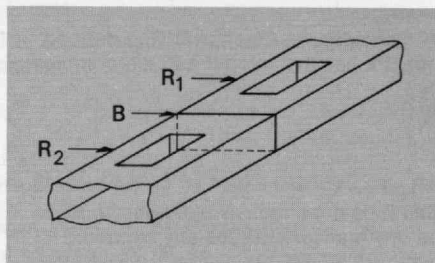
For the case  $0 < x < 1$ , Mr. Yu states that  $\{n_i\}$  is monotone increasing, and he bases his proof on this assumption. Again nonsense! For  $0 < x < 1$  the sequence  $\{n_i\}$  is oscillating. The correct solution is that  $x$  exists when  $0 < N \leq e$ .

John W. Langhaar has also responded

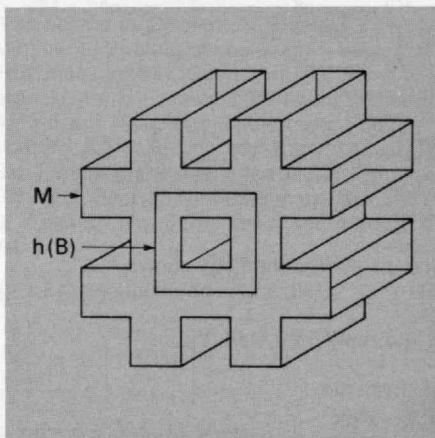
**16** James Bradley and Dennis Ribler at Rochester noticed that the double infinite torus and the single infinite torus are different, since any compact subset of a single infinite torus is contained in a compact subset with connected complement, and the double infinite torus does not have this property. But they could not show that the single infinite torus and the jail cell are the same. A final hint: use classification thin for compact two manifolds with boundary.

The correct answer was found by Edward C. Hendricks:

It appears to me that the intersecting bars surface and the double infinite torus are not homeomorphic, contrary to the statement in the May issue. For suppose, calling the surfaces  $S$  and  $T$ , respectively, that  $h: T \rightarrow S$  is a homeomorphism.

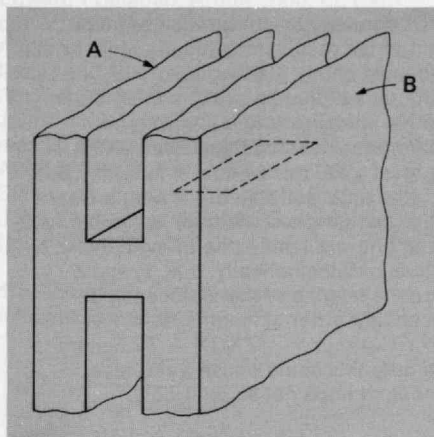
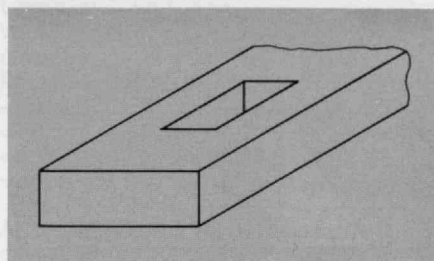


Let  $R_1$  and  $R_2$  be the submanifolds shown in the drawing and let  $B$  be their common boundary ( $R_1$  and  $R_2$  are relatively open and are disjoint from their common boundary  $B$ ), so that  $T$  is the disjoint union of  $R_1$ ,  $R_2$ , and  $B$ . Then  $h(B)$  is compact, since  $B$  is. Thus we can find a compact subset  $M$  of  $S$  such that  $M$  contains  $h(B)$  and  $S-M$  is connected. Since  $S-M$  is connected it is contained in one of the two disjoint connected components,  $h(R_1)$  and  $h(R_2)$  of  $S-h(B)$ .

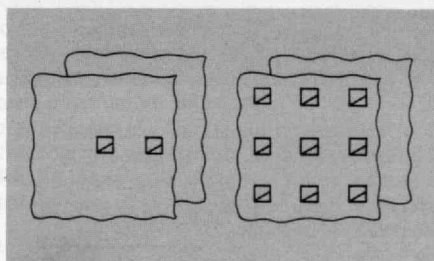
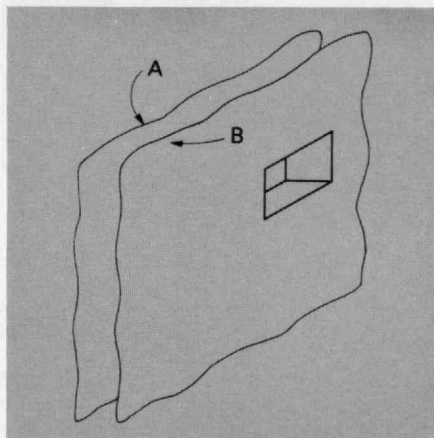


Suppose  $S-M \leq h(R_1)$ . Then  $h(R_2) \leq S-h(R_1) \leq M$ . Thus  $h(BuR_2) \leq M$ . But

$h(BuR_2)$  is closed since  $BuR_2$  is closed, and thus  $h(BuR_2)$  is compact. But  $h(BuR_2)$  is not compact, since  $BuR_2$  is not compact. Similarly if  $S-M \leq h(R_2)$ . It appears from the sequence of manifolds in the following drawings that the single infinite torus is homeomorphic to  $S$ .



The following can be obtained by folding out the sheets  $A$  and  $B$  of the previous drawing.



The left figure, above, is the previous drawing on a smaller scale.

Robert C. Bell also comments on this

problem, noting that my previous hints were incorrect:

Let a "cutting circle" mean a homeomorph of the circle which is not contractible to a point on the surface in question. Then no cutting circle divides the infinite jail cell surface into two pieces. There are infinitely many such cutting circles which divide each of the other two, but in every case such a division of the infinite holed torus which only extends to the right leaves one component with a finite Betti number, while in each case such a cut in the infinite holed torus extending both to the left and to the right leaves both pieces with an infinite Betti number. Therefore no two are homeomorphic.

**18, 19** Frank Model has responded.

**21** Robert G. Hall has responded

**26** Robert L. Bishop, James L. Heyman, and Captain Jerry L. Robertson.

**27** Smith D. Turner.

**28, 29** Finally someone—Samuel S. Wagstaff, Jr.—has solved an Egendorf problem:

Define  $f$  on non-negative integers  $n$  by  $f(n)$ , set equal to the product of the digits of  $n$  (when  $n$  is written to the base 10). It is plain that  $f(n) < n$  when  $n \geq 10$  and that  $f(n) = n$  when  $0 \leq n < 10$ . Thus it makes sense to define the length of a positive integer  $n$  to be the number of iterations of  $f$  required to get to a one-digit number. Now  $f(77) = 49$ ,  $f(49) = 36$ ,  $f(36) = 18$ , and  $f(18) = 8$ , so 77 has length 4. In problem 28 we must show that every other two-digit number has length less than 4. Clearly the numbers 10 through 24 have length 1. The numbers  $n$  of length 2 are just those  $n$  such that  $f(n)$  has length 1, so we ask which  $n$  have  $f(n) \leq 24$ , and we see easily that all  $n \leq 46$  except  $n = 39$  have  $f(n) \leq 24$ , i.e. length  $\leq 2$ . Also note that the numbers 48, 54, 56, 63, 64, and 72 (1) have length 2. The only numbers  $n$  such that  $f(n) > 46$  are the numbers 68, 69, 77 through 79, 86 through 89, and 96 through 99. But, with the exception of 77,  $f$  of these numbers is in (1), so the length is  $\leq 3$ .

As for problem 29, I found no general method but used a computer to go up to 10,000.

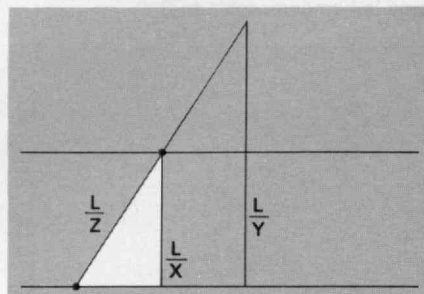
Here is a table showing how many  $n$ -digit numbers have length  $m$ :

$n/m$	0	1	2	3	4	5	6
1	10*	0	0	0	0	0	0
2	0	32	34	23	1	0	0
3	0	223	304	281	83	9	0
4	0	2524	3052	2134	1068	210	12

\*counting 0 as a one-digit number.

The nine 3-digit numbers of length 5 are: 679, 688, and rearrangements thereof (such as 976, 868, etc.), and the 12 4-digit numbers of length 6 are 6788 together

"The three lengths on the base line are used to construct a triangle, and it is made larger or smaller by moving one side parallel to itself to suit one altitude; and this is the desired triangle as follows:



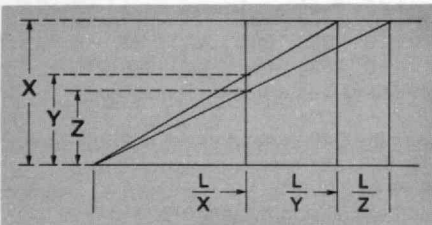
with its rearrangements.

The only other comment I have is that the image of  $f$  is the set of all positive integers whose only prime factors are 2, 3, 5, and 7, and that this is a very thin set of integers. Large integers are very rarely in this set, and the sum of the reciprocals of all the numbers in the set is finite (namely,  $35/8$ ). This leads me to suspect that perhaps there is an upper bound on the length of an integer, but I hesitate to make a formal conjecture in view of the evidence in the above table. As Snoopy once said of Charlie Brown in a similar situation, "How wishy-washy can you get?" Anyway, if any of your readers can find numbers with length greater than 6 or a way of constructing numbers of arbitrarily large length, I'd like to know it.

30 Robert S. Cox.

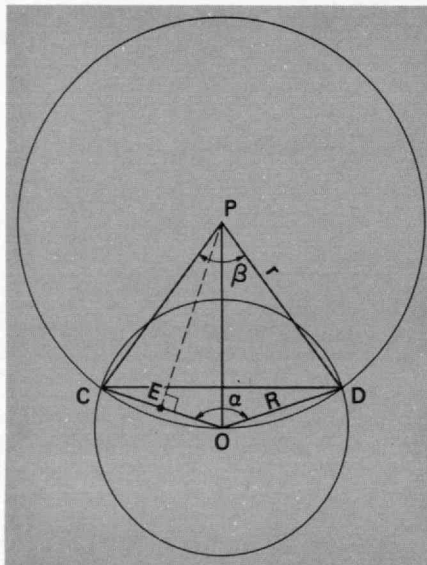
33 Construct a triangle given the three altitudes.

This one provided little trouble for Captain John Woolston; who writes: "As soon as I stopped fiddling with my pencil and engaged my mind, the answer became simple. Since obviously the area of the triangle is constant regardless of which base and altitude you use, the sides of the triangle are inversely proportional to the altitudes and adjusting to one altitude gives the final triangle. Arriving at sides bearing an inverse relationship to altitudes, there are several approaches; but I prefer to construct as follows: Superimpose the three altitudes with bases together with a pair of parallel lines perpendicular to the altitudes through the two ends of the largest altitude, then pick any old point on the base line and draw inclined lines through the ends of the altitudes across the other parallel line and drop perpendiculars to the base as follows:



"Of course, it might be wise to point out to the neophyte geometry teacher that he must check the lengths of his altitudes before he assigns the problem to his students. While it makes no difference how big Papa Bear is (the largest altitude) nor how small Baby Bear is (the smallest altitude) if Mama Bear (the middle sized altitude) is too big, you won't have a family (the triangle doesn't close). Mathematically, if  $X$ ,  $Y$ , and  $Z$  are the lengths of the altitudes in descending order of lengths, then  $1/X + 1/Y > 1/Z$ , or  $Y < ZX/(X - Z)$ . Failure to note this could cause a red face, though I hope not student riots."

Also solved by Sunney D. Alexis, James J. Heyman, Mrs. Mary Lindenberg, R. Robinson Rowe, Smith D. Turner, Samuel S. Wagstaff, Jr., and Mark Yu.



35 A cow is grazing in a circular field A of any given area, say 10 acres. She is tied at O with a chain R long. How long must the chain be for her to cover an area B of one acre?

A very clear answer came from Donald E. Savage: As the chord CD makes evident, the grazing area is the sum of two circular segments. Therefore the grazing area is

$R^2/2 (\alpha - \sin \alpha) + r^2/2 (\beta - \sin \beta)$ . (The formula for the area of a circular segment may be cribbed from Burington's Tables or separately derived.) But from the triangle OEP we see that  $\beta/4 + \alpha/2 = \pi/2$ , and  $\sin(\beta/4) = (R/2)/r$ . Therefore the (grazing area)/(field area) is  $(2/\pi)(R/2r)^2 (\alpha - \sin \alpha) + (1/2\pi)(\beta - \sin \beta) = (1/\pi)[2 \cos^2(\alpha/2)] (\alpha - \sin \alpha) + \pi - \alpha + (\sin 2\alpha)/2 = 1 + (1/\pi)[(1 + \cos \alpha) (\alpha - \sin \alpha) - \alpha + \sin \alpha \cos \alpha] = 1 - (1/\pi) (\sin \alpha - \alpha \cos \alpha)$ .

For this problem, grazing area/field area =  $1/10$ , or

$$(\sin \alpha - \alpha \cos \alpha) = .9\pi.$$

This can be solved only by numerical methods. Using my slide rule, I find after five tries,

$$\alpha = 2.668 (= 152.8^\circ); \text{ therefore } \beta/4 = 90^\circ - 152.8^\circ/2 = 13.6^\circ.$$

Therefore  $R/r = 2 \sin 13.6^\circ = .4704$ . But  $\pi r^2 = (10 \text{ acres}) = 435600 \text{ ft.}^2$ , or  $r = \sqrt{138650} = 372.2 \text{ ft.}$  Therefore the length of the chain,  $R = (372.2)(.4704) = 175 \text{ ft.}$

Also solved by Lionel S. Goldring, William R. Osgood, R. Robinson Rowe, Smith D. Turner, and Samuel S. Wagstaff, Jr.

30 Consider the function  $N(R, x)$  defined (for  $R$  a positive integer and  $x$  a complex) by

$$N(1, x) = x^x$$

$$N(2, x) = x^{N(2, x)}$$

$$\vdots$$

$$N(k, x) = x^{N(k, x)}$$

Can it be continuously extended to  $R$  to be any real (or perhaps any complex) number?

This was solved only by the proposer, Douglas J. Hoylman:

$$\text{We have } \frac{1}{e^x - 1} = \sum_{n=1}^{\infty} e^{-nx} \text{ (proof:}$$

sum the geometric series), and

$$\int_0^{\infty} x^3 e^{-nx} dx = \frac{x^3 e^{-nx}}{n} \Big|_0^{\infty} + \int_0^{\infty} \frac{3x^2 e^{-nx} dx}{n} = 0 + \frac{3x^2 e^{-nx}}{n^2} \Big|_0^{\infty} + \int_0^{\infty} \frac{6xe^{-nx} dx}{n^2} = 0 + \frac{6xe^{-nx}}{n^3} \Big|_0^{\infty} + \int_0^{\infty} \frac{6e^{-nx} dx}{n^3} = 0 + \frac{6}{n^4}$$

(integrating by parts)

$$\text{so } \int_0^{\infty} \frac{x^3}{e^x - 1} dx = \sum_{n=1}^{\infty} \int_0^{\infty} x^3 e^{-nx} dx$$

$$= \sum_{n=1}^{\infty} \frac{6}{n^4}$$

and, as every schoolboy knows,  $\sum 1/n^4 = \pi^4/90$ , so the solution is  $\pi^4/15$ .

A late reply from Mark Yu.

37 Evaluate

$$\int_0^{\infty} \frac{x^3 dx}{e^x - 1}.$$

The following solution is from Arthur Gelb: Multiply the numerator and denominator

by  $e^{-x}$ . This yields

$$I = \int_0^{\infty} (x^3 e^{-x}) / (1 - e^{-x}) dx.$$

The integrand is well behaved as  $x \rightarrow 0$ ; for all other values of  $x$  we see that  $e^{-x} < 1$ . Thus we expand the denominator as follows:

$$\begin{aligned} I &= \int_0^{\infty} x^3 e^{-x} (1 + e^{-x} + e^{-2x} + \dots) dx \\ &= \int_0^{\infty} x^3 e^{-x} \left( \sum_{n=0}^{\infty} e^{-nx} \right) dx \\ &= \sum_{n=0}^{\infty} \int_0^{\infty} x^3 e^{-(n+1)x} dx. \end{aligned}$$

The integral under the summation is repeatedly integrated by parts ( $u = x^3$ ,  $dv = e^{-nx} dx$ , etc.), yielding

$$\begin{aligned} I &= \sum_{n=1}^{\infty} 3/n \int_0^{\infty} x^2 e^{-nx} dx \\ &= \sum_{n=1}^{\infty} 3/n \cdot 2/n \int_0^{\infty} x e^{-nx} dx \\ &= \sum_{n=1}^{\infty} 3/n \cdot 2/n \cdot 1/n^2 = 6 \sum_{n=1}^{\infty} 1/n^4. \end{aligned}$$

The series has a known summation, namely

$$\sum_{n=1}^{\infty} 1/n^4 = \pi^4/90. \text{ Thus, for the result we get } I = \pi^4/15 = 6.493 \dots$$

Also solved by R. Robinson Rowe, Donald Savage, W. Allen Smith, Samuel S. Wagstaff, Jr., James A. Waletzko and Mark Yu.

### 38 Show that $\frac{abc, abc}{77}$

is always an integer.

R. Robinson Rowe had so little trouble that he felt this should have been a speed problem. He notes that  $abc, abc/77 = (1001)abc/77 = 13abc$ , an integer.

Also solved by Dermott A. Breault, Michael L. Burach, Lance Draper, Edward Friedman, John H. Goncz (who wrote from Australia), James J. Heyman, Deena A. Koniver, Mrs. Mary Lindenberg, Philip M. Roth, Frank Rubin, John Rudy, Leslie Servi (ninth grade), W. Allen Smith, Daniel H. Sparrel, Neil Steinmetz, Samuel S. Wagstaff, Jr., Jared Wolf, and Mark Yu.

### 39 Prove that

$$\sum_{i=1}^n i^3 = \left( \sum_{i=1}^n i \right)^2$$

or give a counterexample.

Frank Rubin has supplied us with the following proof by induction:

The statement is clear for  $n = 1$ . Let  $L(n)$  and  $R(n)$  be the left-hand and right-hand sums, and

$$S(n) = \sum_{i=1}^n i. \text{ Then}$$

$$\begin{aligned} L(n+1) - L(n) &= (n+1)^3. \\ \text{We will show that } R(n) \text{ obeys the same recursion:} \\ R(n+1) - R(n) &= [S(n) + n + 1]^2 - S(n)^2 \\ &= 2(n+1)S(n) + (n+1)^2 \\ &= 2(n+1)[n(n+1)/2] + (n+1)^2 \\ &= (n+1)^2(2n/2 + 1) = (n+1)^3. \end{aligned}$$

Also solved by Robert A. Bender, Dermott A. Breault, Michael L. Burack, Jon A. Davis, Lance Drager, Donald Fausett, Edward Friedman, Arthur Gelb, Lt. Randall V. Gressang, James J. Heyman, Anthony W. Merz, Rober Milkman, J. Pellissiei and P. Bergh (jointly), Philip M. Roth, R. Robinson Rowe, Frank Rubin, John Rudy, Donald E. Savage, Homer D. Schaaf, Michael Schaeffer, W. Allen Smith, Daniel H. Sparrel, Neil Steinmetz, Samuel S. Wagstaff, Jr., John Yoachim and Robert Gottlieb (jointly), and Mark Yu.

40 Plot, using Cartesian coordinates, the following equation:

$$\begin{aligned} &\left\{ 2y - \frac{5|x|}{1 + e^{A(|x|-16)}} - \frac{\sqrt{1 + \frac{10}{A} \left( \frac{x}{16} \right)^2}}{A} \right\} \\ &\left\{ A^2(x-30)^2 + \left( \frac{y}{20} - 1 \right)^2 - 1 \right\} \\ &\left\{ y - 40 + 40 e^{-A(x-53)^2} \right. \\ &\left. + \frac{\sqrt{1 - \left( \frac{x-53}{16} \right)^2}}{A} \right\} = 0 \end{aligned}$$

where  $A$  is some large positive number, such as 1000.

The three answers received were all different. The proposer's (Donald E. Savage) is given for reasons that will be obvious:

As is usual, the words "Plot . . . the following equation" refer to plotting all real number pairs  $(x, y)$  that satisfy the equation. Since the right hand side is zero, any number pairs that make a bracket zero will satisfy the equation, so that one can plot each bracket separately. Setting the first equal to zero and rearranging,

$$y = \frac{5/2 |x|}{1 + e^{A(|x|-16)}} + \frac{\sqrt{1 + 10/A - (x/16)^2}}{2A}$$

Since  $A$  is so large, it is evident that the first term is approximately  $5/2 |x|$  for

all  $|x|$  more-than-a-hair less than 16, and is nearly zero for all  $|x|$  more-than-a-hair more than 16. In the vicinity of 16, the first term travels between these two extremes. The second term is a trick to limit the range of  $x$ . Since the first term is real for all real  $x$ , the second cannot become complex without making  $y$  complex. Thus the quantity under the radical sign must stay positive, i.e.,  $|x| \leq x_1$ , where  $x_1 = 16 + 80/A$ . The second term is very small throughout this range. At  $x_1$ , the denominator of the first term is approximately  $1 + e^{80}$ , which is enormous. Summing up, the first bracket may be sketched as

**M**

The second bracket, set to zero, is the equation of skinny ellipse. Remembering that the equation of an ellipse with axes along the coordinate axes is  $(x/a)^2 + (y/b)^2 = 1$ , we see that this ellipse is centered on the point  $(x = 30, y = 20)$  and has half axial lengths of  $1/A$  and 20. Thus this bracket's plot may be sketched as

**I**

The third bracket is a skinny inverted Gaussian function, with origin at the point  $(x = 53, y = 40)$ , and height = 40. (The radical term is just my trick to limit the range of  $x$  to  $53 \pm 16$ .) Thus this bracket may be sketched as

**T**

Putting them all together, we get

**MIT**

(rah! rah!).

**SD9** Although I normally do not acknowledge responses to speed problems, I will make this exception; Sue Kayton has solved SD9 "without any help." (She is 11 years old!)

Allan J. Gottlieb, who studied mathematics at M.I.T. with the Class of 1967, is a Teaching Assistant at Brandeis University. Send answers and problems to him at the Department of Mathematics, Brandeis University, Waltham, Mass., 02154.



# On Naiveté, Shallowness, and Population

## The Computer in Social Research

To the Editor:

Because we are currently applying the techniques of industrial dynamics to a social system problem we read Jay W. Forrester's article in the May, 1969 issue of *Technology Review* with great interest. We are in complete and enthusiastic agreement with Professor Forrester as to the value of the "dynamic feedback" approach for considering the behavior of complex social systems. However, there are certain behavioral factors associated with the application of this technique which Professor Forrester has neglected to discuss.

In the application of this modeling technique the researcher must be, and must remain, keenly aware that it is a simulation technique and that quantitative descriptions of the behavior of components of social systems are, at best, difficult to obtain. Furthermore, the technique is intended to characterize response over time and not specifics at points in time. The development and verification of a social system model, if carried out as described in Professor Forrester's *Industrial Dynamics*, depend primarily on the researcher's perception of the behavioral mechanisms of the prototype.

Because of this it is mandatory that the researcher operate in a context which insures that he remain sensitive to the prototype system; otherwise it can be expected that validation procedures will provide a reinforcement of the researcher's own interpretation of the observed behavior of the social system. The preceding considerations and their ultimate implications are not adequately described by Professor Forrester.

In considering the urban problem, Professor Forrester has structured the boundaries of his system such that he draws the unexpected, but not improbable, conclusion that a reduction in the quantity of housing available to the underemployed is an appropriate policy for long-term economic growth in a city. Thus, because long-term economic growth is presumed to be "good," is it implied that reduction in housing for underemployed is a desirable policy for urban systems. The rates and levels

which Professor Forrester describes do not contain many social factors which would respond to such a policy, factors which are obviously present in the urban system. Further, it is possible that these factors, if included in the system, would either preclude the implementation or negate the anticipated system response of such a policy.

Because of the current sociological phenomenon that a computer orientation lends a sense of validity, presentation of such an article by someone of the stature of Professor Forrester must be done with meticulous care. The complexities of research, and the intricacies of programming, are effective means of masking the great quantity of individual judgment which takes place, particularly in social research, where much depends upon the viewpoint. In his short article, Professor Forrester has neglected to state and indicate the implications of all his assumptions. As research into social systems evolves to the point where it can be a tool for policy-making, reporting of such research must also evolve to a higher level so that the key factors and assumptions are presented to the public; without this, any model is fundamentally an expression of the viewpoint of the model-builder in regards to the social system under study.

William E. Gates  
Richard M. Males  
Oakland, Calif.

## On the Sakharov Paper

To the Editor:

I have just finished reading "The Sakharov Paper" and its attendant articles in *Technology Review* June, 1969. With respect to the abstracts of the paper which you published, one could say that Sakharov has somewhat of a naive view of international problems. On the other hand, he is quite convinced of the superiority of socialism and its eventual absorption of capitalism, so perhaps his naiveté is not as great as Professor Rabi believes. In any event, my comments are not directed to the paper so much as to the attitudes of Professor Rabi and, of course, Mr. Salisbury.

As a parent of four college students,

two finished and two in the process, I am continually amazed at their ignorance of the real world of international politics. If I had read Professor Rabi's comments sooner, my amazement would not have been so great. Among other well-known world perils, Professor Rabi (and Professor Wald) have apparently just discovered the atom bomb . . . something which the rest of the world has been living with for about 20 years. So with Barry Commoner in "Science and Survival." Now this is not to dispute anything of its cataclysmic nature, but I think it would be worthwhile to mention the historical background and not to present it as something which (and I admit to a bit of reading between the lines) is basically the fault of the U.S.A. For example, there would be no need of the A.B.M., Polaris, Minuteman, etc., if it were not in response to aggressive actions and threats from Sakharov's government. I suppose, in Professor Rabi's viewpoint, to discuss these points in college classrooms would not contribute to world peace; however, it seems to me that we cannot have an informed college class unless we discuss *all* sides of the question.

Mr. Salisbury and Professor Rabi are, it seems to me, most naive of all. Naturally, individual Russians must enjoy life and dislike death as much as any human. I am sure that if there could be a vote in Russia, the majority would agree to immediate limitations of arms, would not have permitted the invasions of Hungary and Czechoslovakia, and would stop the Vietnam conflict overnight by simply refusing to ship arms to North Vietnam. It is obvious that this cannot happen, for the simple reason that individual Russians have no control over their government in any way. This fact is so apparent that I am astounded that so much is made of the Sakharov comments. As a statement of an individual American in his position, it might have considerable weight; but as a statement of an individual Russian, it has no significance whatsoever . . . except to the extent that Sakharov is by now probably in a concentration camp. This "other worldliness" may be excused in Professor Rabi but cannot be excused in a man of Mr. Salisbury's experience. What kind of responsible commentator could say, in all

apparent sincerity, that "In Russia . . . the intellectual has always been looked up to by the masses; even Stalin, who executed them by the thousands, venerated the intellectuals" (Salisbury, page 37) . . . perhaps this is gallows humour?

But deeper than the above specific comments, is the fear that our educators, Nobel Prize winners or not, have so little touch with reality that they can lead our college students to completely erroneous and hopeless conclusions about the world today and America's place in it.

We need an honest and sensible foreign policy, to be sure, and we have not had one since we came out of our isolationist cocoon. Perhaps if we read and understood Henry Kissinger's *American Foreign Policy* we would all be better informed. I recommend it to Professor Rabi and Mr. Salisbury, but I suspect their minds are already made up.

Peter Leckie-Ewing  
Petersham, Mass.

## More Conditions and Measurements

To the Editor:

Dean John P. Eberhard's article on "Man-Centered Standards for Technology" (*July/August*, pages 50-54) is disappointing because a deep thinker has overlooked some existing conditions and "measurements."

To approach the extent of measurements Mr. Eberhard describes, each man is his own measuring instrument, in his own reactions and responses. Would a "Big Brother" Bureau in the government be better able to decide for each individual what his responses are, than would the individual?

Second, the individual man's "measurements" and responses to all man-made objects (and services) are tabulated in total by one field of our existing scientists. We quote from Professor Campbell R. McConnell's well-used textbook *Economics*: "Consumers, unrestrained by government and possessing money incomes from the sale of resources, spend their dollars upon those goods which they are most willing and able to buy. These expenditures are in effect 'dollar votes' by which consumers register their wants through the demand side of the product market." Professor McConnell also discusses the effects of re-distribution of income and of advertising on these "dollar votes," and the latter, particularly, does directly affect the psychological and sociological reaction.

Third, when he used housing as an example, as an architect he should realize that architects and real estate developers certainly must consider the psychological and sociological needs of man, as well as the physiological needs, in order to furnish housing which the particular man in that market will want. The housing which

the man measures as to being to his liking, he will buy, and the housing which he measures as not to his liking, he will not buy.

So, contrary to his statement of page 54, the infinite capacities of the human are a part of the process of measurement, and the standards of all of the competitive portions of our business and industry are directed toward summing up the measurements of the individual human in order to determine what products and services to produce to meet the needs and wishes of each individual human, in our nation. All progress does require change, but all change is not necessarily progress. It would hardly be progress to set up one more government bureau to try to decide how man is measuring. To use some of his words, further increase of debt would be the "heritage" we would "create for our children and their children's children," without contributing any progress.

John Cooper Shackelford  
Greenville, South Carolina

*Dean Eberhard replies:*

I believe Mr. Shackelford probably shares the same concern as many others. My only comment is to paraphrase the quotation from Max Planck: A new view of man-centered standards will not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die and a new generation grows up that believes in this new view.

## Contamination of Space

To the Editor:

Mr. Robert Cowen in the April issue of *Technology Review* (last paragraph, page 8) talks of possible contamination of space using fusion explosions. Do fusion reactions produce any radioactive contamination at all? Can it not be said that there will be no contamination?

Larry Krivit, '52  
Monroe, New York

*Mr. Cowen replies:*

Mr. Krivit refers to the scheme to explode fusion charges behind a space ship to propel it. Actually, there would be radioactive debris as long as a fission trigger were needed. For this reason, the craft would be used in deep space, far from Earth. Out there, the fission products would not contaminate space. They would mingle with the solar wind particles as an exotic impurity. Ultimately, one would hope for a pure fission explosion—the old "clean bomb" business. Then the debris would be even more like the solar wind.

## Food versus Population

To the Editor:

Professor Sylvan H. Wittwer presented the great advances in food production in the U.S., and in other countries, during the past few decades and predicted that "we have already witnessed the last

great famine on this earth."

He cited Mexico as an outstanding example and stated that "In Mexico food production has doubled and wheat yields have increased four-fold in the past 20 years." But Mexico's population is increasing at the rate of 3.5 per cent per year, a rate that doubles the population every 20 years. If this growth rate could be maintained, the population of Mexico would equal the present population of the U.S. in 42 years, exceed the present world population in 130 years and reach 50 billion in 200 years.

Obviously food production cannot keep pace with such a rate of population growth for any significant period of time. Although great advances in food production have been made in Mexico, 40 per cent of the children under the age of 10 years are malnourished, according to Dr. Rogelio Valenzuela of the Mexican Social Security Institute. He estimates that in Latin America, where the rate of population growth is 3.0 per cent per year, two-thirds of the children under the age of 5 years are malnourished. Inadequate nutrition during these critical years can result in irreparable physical and mental defects.

The modern Western nations are primarily responsible for the population crisis in the underdeveloped nations because they introduced death control without introducing birth control. Unless birth rates are rapidly reduced in the underdeveloped countries of the world great famines are inevitable in Asia, Africa and Latin America.

Karl Sax  
Media, Pa.

*The writer is Professor of Botany, Emeritus, at Harvard University and former President of the Massachusetts Planned Parenthood League.—Ed.*

*Professor Wittwer replies:*

The "food productivity explosion" in Mexico has exceeded the "population explosion" during the past 20 years. This in spite of the fact that population increases per year (3.5 per cent) in Mexico are currently as high or higher than any nation on earth.

Relative to food supply and population, all previous projections on our agricultural output capacity have proven far, far too conservative (James Bonnen, *Proceedings of the Agricultural Research Institute*, 1963, pages 65-114). This is especially true of the past two years in which the most remarkable record in all history in food production at home and abroad has occurred.

We have overextended ourselves in emphasizing food and hungry peoples as the world's most crucial problem. A more eminent disaster may reside in the people of the earth creating an environment in which we will have great difficulty of healthy survival in the wastes that we and our culture are creating.



who are truly worried about the future of our country and who are seeking the proper solution to a better world.

Robert L. Purvin  
New York, New York

### **"Thru you, We Touched the Moon!"**

To the Editor:  
Victor K. McElheny's article in the *Review* for October/November inspires this observation.

When Neil Armstrong took his turn addressing President Richard M. Nixon and America at a dinner given for him and his colleagues in Los Angeles on August 13, he spoke words that, to me, expressed the dignity of a great and noble man.

There was no superficial sincerity forthcoming. Neil Armstrong, looking a trifle fatigued after a very busy day of ticker tape and confetti parades and travel, spoke humbly of an inspiring impression which was left indelibly upon him: a simply-written placard carried by an admiring spectator in New York City which read, "Through you, we touched the Moon."

His answer to this message exemplifies the greatness and symbolic Americanism of our astronauts; he returned the placard's message to America, with these words: "Thru 'you,' 'we' touched the Moon."

Imagine the utter simplicity of this wise astronaut, who might very well have been so preoccupied that he singly would have represented "my" thoughts and feelings, thinking that all this was "for 'my' benefit and concerns 'me' and 'my' affairs..."

The wisdom of Neil Armstrong, Michael Collins and Edwin Aldrin is based upon an advanced "specialized knowledge" of the "highest level" of consciousness inspired by courage and the splendor of adventure in pioneering for America and humanity.

Theirs could very well have been the ultimate of all sacrifices, the precious commodity, life itself. Instead, they reached for the Moon and conquered it. Who could possibly ask for more...?

Linda A. James  
Fairfax, Va.

### **Protesting the Moratorium**

To the Editor:  
So many people of prestige and distinction, from college presidents to Congressmen, announced their support of the October 15 "Moratorium" protesting the Vietnam War and praised the morality and wisdom of that demonstration so effusively that those citizens such as myself, who did not participate in it, feel almost compelled to make a public state-

ment of their reasons for such a stand.

I did not wear a black armband on October 15, but I do not grieve for our young dead less than others. The demonstration was no doubt seen by most of its participants as an expression of sorrow for the lost and of concern for the young men now exposed to the dangers of this tragic war. The organizers and prominent early supporters of this affair (Sam Brown, Benjamin Spock, George Wiley, etc.) proclaimed by public statements and advertisements that its purpose was to proclaim an interpretation of recent history (that the United States is a criminal government that brutally invaded a peaceful Vietnam whose people were united in loyalty to a benevolent, democratic, and nationalistic Ho Chi Minh) which is patently absurd; and to demand a course of action (immediate, unilateral withdrawal) which almost every student of foreign affairs thinks disastrous. (Two months ago Senator Fulbright indignantly accused the President of slander for implying that he favored such a course.)

Any demonstration must be interpreted as indicating support for its organizers and their ideas, men I despise and policies I (and most Americans) condemn. In other countries the demonstration must be viewed either as an American confession of guilt, or, far worse, as evidence of American lack of courage.

I cannot accept the theory that all history before 1965 is irrelevant and therefore cannot see how the loss of monolithicity by the communist dictatorships ends their danger to us. Fascism was not monolithic in 1939; Germany, Italy, and Japan were united principally in their belief that the democracies were too cowardly and internally divided to resist any aggressions. The October 15 demonstration gave support to similar ideas in Russia, China, and Korea, possibly with similarly disastrous results.

Harry G. Parke  
Brooklyn, N.Y.

### **Tech-Croscopic Solution**

*The correct solution to the Tech-Croscopic appearing on pages 84 and 85 of this issue is:*

"Similar, though perhaps much more complicated, formulae may serve to represent the propagation of Hertzian waves or the radiation which, as a rule, goes forth from any electromagnetic system that is not in a steady state."  
— H. A. Lorentz, *Theory of Electrons*

### **The Strategy of Arms Reduction**

To the Editor:

I read Dr. Jerome B. Weisner's statement in *The Technology Review* for March, 1969, and was at that time struck by what I consider to be a most dangerous position, but reading Dr. Weisner's reply to Carol E. Belton's letter in your July-August issue further confirms my concern, and although I am not normally a "letter writer" I felt that I would like to make a comment. When people with the intelligence and abilities of Dr. Weisner exhibit the naivete shown by him, both in his original article and in his reply, I feel that all peoples must be concerned. We all want to live in a free decent society. We all want to use our boundless talents and resources to make a better world. We are all convinced that eliminating the arms race would permit the hope of creating a better world. But whatever possesses Dr. Weisner to believe that we have any evidence that there is any mutual interest with the Soviet Union and the Chinese Peoples' Republic. I would be most anxious to know, and I feel sure that he would be doing our country a great service if he would make this point evident. He admits that there is danger presented by the possibility of non-compliance by some of the participants, and he vaguely suggests a substantial safe-guarded reduction of strategic forces which would appear to imply that some relationship exists between the quantity of strategic forces and the risks we should be willing to take. Unfortunately, humanity does not follow physical laws which would permit us to evaluate human behavior in an objective manner.

I must admit that I would agree with him that the smaller nations of the world would fare considerably better in his kind of world because the major powers would be more than occupied in subverting and taking over the large ones who are so foolish to expose themselves in such a calculated manner.

Again I reiterate, I do not worry too much when the crackpots and idealists of this world make such comments, but from a man of Dr. Weisner's stature, who we have come to believe is of unusually high calibre, it must concern those of us



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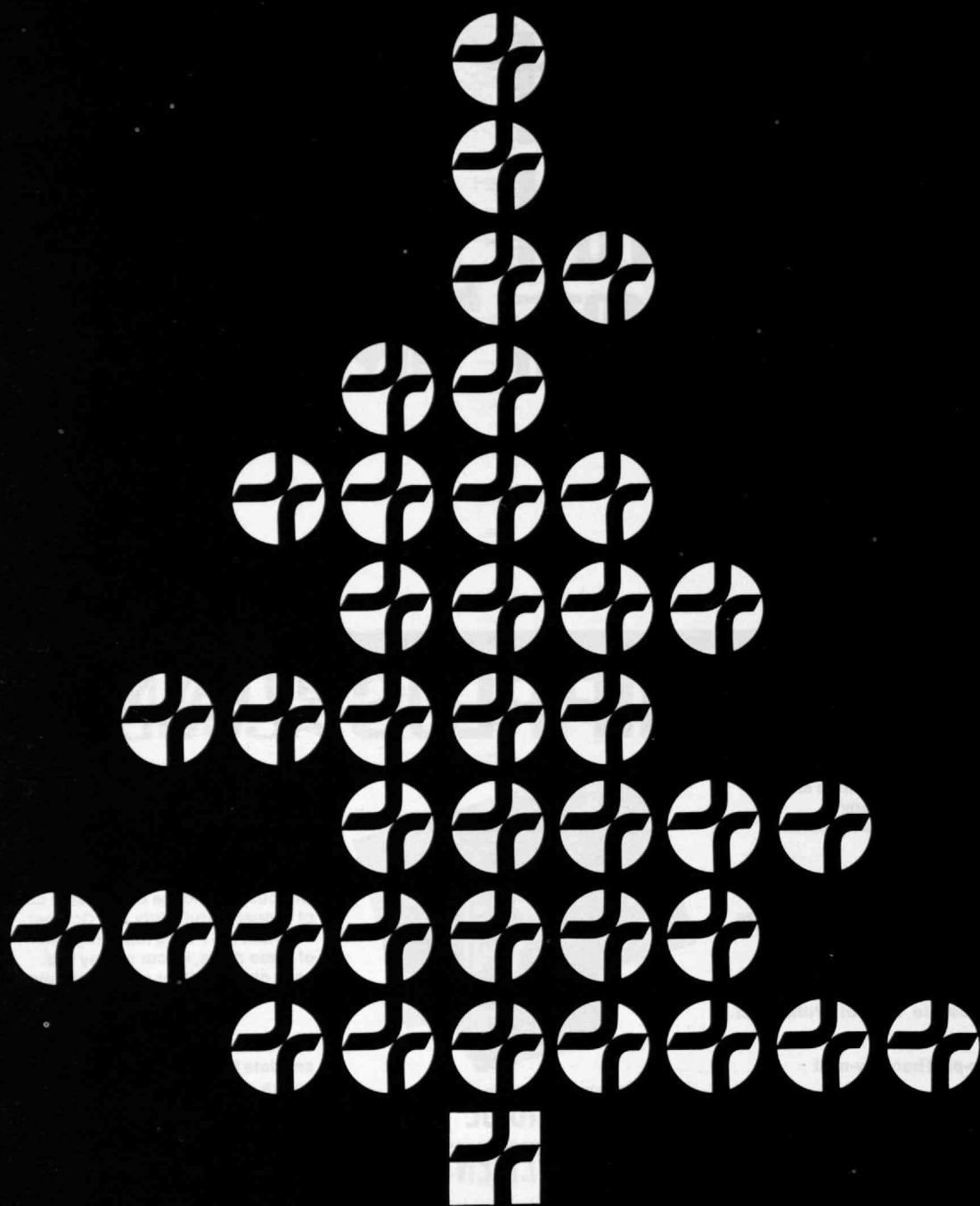


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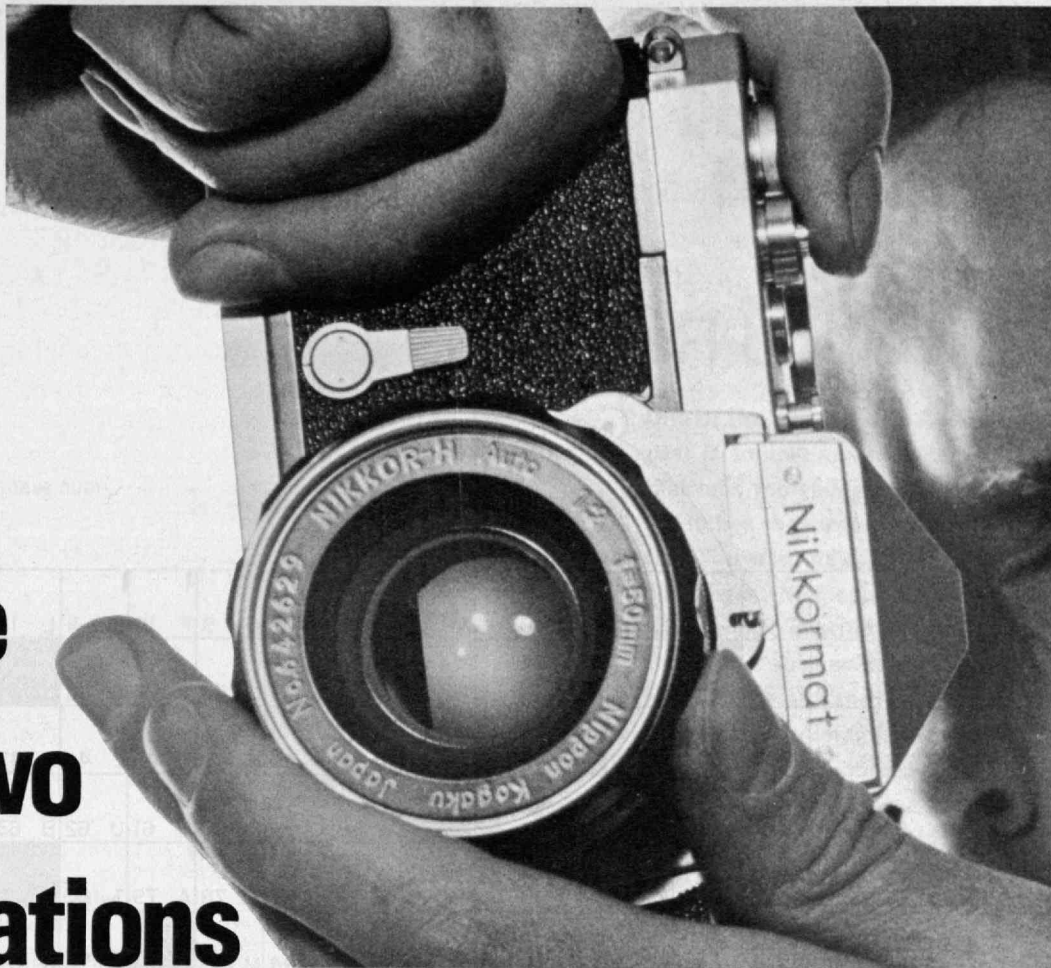
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# Waves and Radiations

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Use the definitions at the right to help define the words to which they refer; then enter the appropriate letters in the diagram to complete a quotation from a work on theoretical physics. The first letters of the defined words give the author and title from which the quotation is taken. Black squares in the diagram indicate the ends of words; then there is no black square at the right end of the diagram, the word continues on the next line.

The correct solution to this Tech-Crostic appears on page 78 of this issue of *Technology Review*.

David L. Holt is Assistant Professor of Metallurgy at M.I.T. He will welcome readers' comments; address him in care of *Technology Review*, Room E19-430, M.I.T., Cambridge, Mass., 02139.

- A. American inventor
- B. Bears witness (2 words)
- C. French astronomer and mathematician
- D. Eject, dispossess, expel
- E. Physicist associated with x-rays
- F. Biblical country, land of the descendants of Esau
- G. One of the Bachelors Three
- H. Porous rock formed as a deposit from springs or streams
- I. Division of spectral lines by a magnetic field (comp.)

83	79	110	138				
6	150	37	100	63	159	51	77
120	18	70	139	36	113	28	
166	22	153	142				
128	72	169	67	147	181	109	
173	103	10	145				
90	179	3	117	156	17		
56	44	131	174				
87	64	55	158	46	80	15	126
	38	152	180				



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J. The hydrogen isotope of mass number three	86	118	168	66	112	11	25	
K. Rule in optics (2 words)	24	119	50	75	140	136	1	171 60
	101	88	165	29	163	19	45	52
L. A permanent impression left as the result of a stimulus	149	65	12	132	92	31		
M. Planetaria	127	143	7	47	58	107	157	95
N. Relation; proportion	97	49	172	78	26			
O. Deviate from line of flight by angular motion about the vertical axis of an airplane	176	146	91					
P. A member of an important tribe of Siouan Indians of Nebraska	57	134	74	114	161			
Q. In truth; indeed	40	144	61	177	81	123	129	9
R. Capacity for radiating	69	21	34	155	125	104	93	4 98
	137							
S. The scientific study of the quantitative aspects of population	33	170	16	151	106	68	43	2 23
	116							
T. National park threatened by economic interests	59	54	94	85	122	5	76	39 121
	164							
U. Projecting piece of timber or iron near the bow of a vessel, to which the anchor is hoisted and secured	35	115	167	13	62	135	175	
V. Volcanic rock consisting mainly of feldspar	178	27	89	141	99	154	162	124
W. Orator	42	130	84	8	108	53		
X. German physicist, 1787-1854	133	111	48					
Y. Having no face value	148	30	-14 -102	71				
Z. Greek poet	20	105	32	73	160	96		

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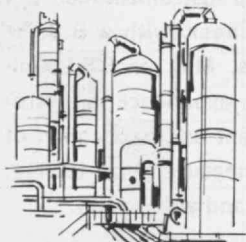
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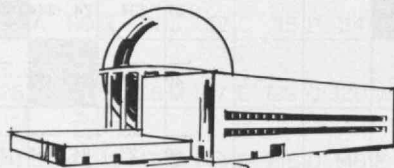
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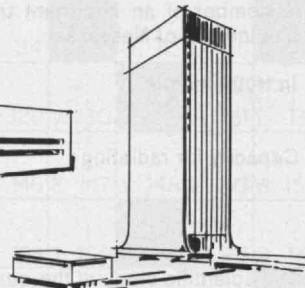


Chemical Plants

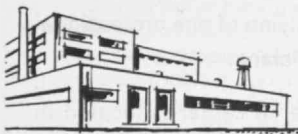
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Nuclear Reactors



Office Buildings

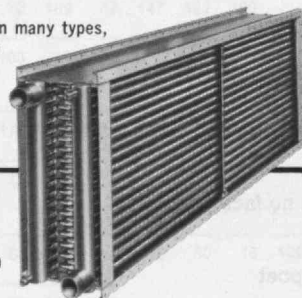


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*When the head of the parade marching from M.I.T.'s convocation to Boston Common on Moratorium Day (October 15) reached the Boston side of the Charles River, the end was still on the Cambridge side—nearly half a mile away. After speaking at the Convocation, Jerome B. Wiesner, former White House science adviser, took his place in the front ranks of the parade. (Photo: Craig Davis)*

## A Moratorium Without Misrepresentation

Many different views on the Vietnamese war were united on October 15, when an estimated 5,000 members of the M.I.T. community participated in the national Moratorium Day to protest the war; the Moratorium's largest gathering—100,000 strong—was on the Boston Common.

M.I.T. official response took several forms. Early in October the M.I.T. Corporation approved a statement by proposing that faculty and students "consider jointly" the response they wished to make to the October 15 moratorium, making certain in the process that members of the community remained free "as always, to follow the dictates of their consciences." Later, at a special meeting, the faculty passed a resolution calling for a convocation on October 15 in Kresge Auditorium and urging President Johnson to release employees wishing to participate.

However, to respect the rights of those who wished to carry on "business as usual," the faculty voted not to cancel classes, and the Institute remained



## "... A Major Diversion from Pressing Social Problems ..."

*Following is the text of a personal statement on the Vietnamese war to the members of the M.I.T. community by Howard W. Johnson, President of the Institute, on October 2, 1969:*

"As president of an educational institution, I do not speak for it or represent it in matters related to political issues. I do, however, work with students, and I am concerned by what I see happening to the quality of education. I have decided that the following statement, which is personal and does not claim to represent the views of my colleagues on the faculty and the Corporation, should be made at this critical time. I hope it will encourage other individuals in our community to consider their own positions on these matters during the period ahead.

"Much of the present unrest on the campuses stems from a recognition by most of us—students, faculty, and staff—that there is a serious gap between the goals that we profess as a nation and our ability to meet these goals in our actions. As educators we often appear to be on the defensive because of the difficulties in reconciling this gap. Learning suffers and the student-teacher relationship becomes strained and suspect.

"The Vietnam war has resulted not only in a tragic loss of life but in a major diversion of our national resources and attention from pressing social problems. The effects of the war are the source of the deepest dissatisfaction to many of our colleagues, young and old. The prospect of being drafted to fight in the war is only a small part of the problem. As a matter of conscience, it is difficult for many students to concentrate on their academic goals when conditions exist which make them question the intrinsic worth and well-being of the society. Effective learning must always proceed from individual motivation. Students who have been questioning and opposing the war since they were freshmen have now graduated; the seeming impotence of their efforts to bring about effective change has produced a profound disillusionment.

"It is my judgment that our educational system cannot function for the maximum benefit of all involved until this war is over. The end of the war will not solve our problems at home, but it will allow us to concentrate wholeheartedly on the nation's urgent agenda. We need the idealism, the energy, and the intelligence of the young to achieve the unity of effort required. I have confidence in our ability to solve the larger problems, and the sooner we get on with the job, the better."

formally open. No estimate is available of the number of classes cancelled, or of the number of employees who left their desks.

Then, in an unprecedented move, the faculty also voted a "sense of the meeting" resolve which stated: "We call for prompt and total withdrawal of U.S. forces from Vietnam and immediate reordering of our international and national priorities." The resolve passed after some debate and after a tie vote to table the motion was broken when the President, as chairman of the meeting, added his own vote to preserve the faculty's opportunity for discussion.

### "The Voices of Humanity. . ."

When October 15 came, President Johnson found himself presiding at a half-hour convocation which brought more than 360 people to the Kresge Auditorium plaza. He called the war "wrong" because of its "effects on young people's hopes and beliefs" and because it "stands in denial of so much that is best in our society." But, he said, a university's central problem in such a day is "whether it can bear itself so as to not misrepresent any part of it."

Judith Schwartz, representing a secretaries' group which had lobbied for permission to participate in the day's activities, said, "No longer can we be silent. We secretaries, as women, are asked to . . . see that things run smoothly. It's time we had a chance to find out what it is that we are expected to keep running so smoothly. . . . Do we have jobs that are consistent with our values?"

Jerome B. Wiesner, Provost, speaking as a private individual to the audience, made what many found the most moving statement of the day. "The voices of humanity," he said, "say that it is hard to be proud of our vast power punishing a tiny country that doesn't know how to quit. They say that pride should not compel us to continue the carnage and destruction of the past five years. And all these voices," continued Dr. Wiesner, "are saying urgently and desperately that we should have the courage to face our mistakes and wrongdoings squarely."

Finally, a student organizer of the Moratorium at M.I.T., Stephen C. Ehrmann, '71, explained why he and some other of the organizers had decided to participate. He said, "An awful lot of us have never marched before, and we are nervous in our new roles, but we feel something has to be done." He called for a moment of silent meditation about the war, and all 1,200 people in Kresge were silent.

There followed a quiet procession which more than filled two lanes of the Harvard Bridge from end to end on its way to Boston Common—a deeply emotional experience for many of the participants. The few who feared violence found their expectations unfulfilled; the many who assumed that the White House could not in fact be blind to their numbers and sincerity await a verdict.

## Scientific Training for the Disadvantaged

An attempt to launch a nationwide program through which individual scientists could give on-the-job training in their laboratories to the disadvantaged was turned down by the White House last summer.

Herbert L. Meltzer and Gerald Cohen, Assistant Professors of Biochemistry at the New York State Psychiatric Institute, were told that the government could not support their proposal to train up to 25,000 disadvantaged as laboratory technicians over the next two years.



*Technical institutions can offer special opportunities to the disadvantaged, as an M.I.T. study recently outlined (see right). In addition, two New York city researchers proposed a plan earlier this year by which an individual scientist*

*could take one unskilled person into his own laboratories for a two-year training program; however, their proposal was not granted the necessary federal funds. (Photo in the M.I.T. personnel office: Ivan Massar)*

Professors Meltzer and Cohen had mailed their proposal to an estimated 10 per cent of the nation's scientists by random sample and received 1,250 signatures of those who would be willing to take a disadvantaged person into their laboratories and personally provide training. Extrapolating from these figures, they estimated that eventually some 25,000 members of the estimated 250,000 members of the scientific community would want to participate, thus training 25,000 disadvantaged.

Their proposal called for \$5,000 annually per trainee to keep him above the poverty level during the two-year training. If given this support, 80 per cent of the signers pledged to add another hour to their working day in order to insure that they could give personal attention to the trainee. Upon successful completion of training, they would help the trainee find employment using his new skills.

The two biochemists conceived the plan after the assassination of Martin Luther King, Jr., in April, 1968. They based it on their own experience in training a volunteer from a Newark, N.J. ghetto, to work in their laboratory in New York City.

After learning from members of Congress the difficulty of revising current laws prohibiting Congressional appropriations to pay the wages of employees of private institutions, the two biochemists turned to the White House and sent copies of their proposal to all Cabinet members and to the Office of the President.

They received letters endorsing the idea from Vice-President Spiro T. Agnew; Health, Education, and Welfare Secretary Robert Finch; Treasury Secretary David Kennedy; and Special Assistant for Urban Affairs Daniel P. Moynihan. But when it came to finding an executive mechanism for supporting the program, none apparently existed, they said.

Thus, an assistant to Dr. Moynihan, Chester E. Finn, Jr., replied to Professors Meltzer and Cohen, "Much as it is to be regretted, I must tell you that present budgetary constraints are such that I doubt the feasibility of federal support of this program at this time. I don't mean to discourage you from bringing it up again in another year, or to deny our very real enthusiasm for the ideas you suggest, but only try to be realistic."

What next? "We haven't yet decided what action to take," Professor Meltzer told *Technology Review*, "and we are looking for help and ideas."

## A Hiring Program for Blacks, With a One-Year Review Clause

After a 10-month probe into hiring and promotion at M.I.T. for non-academic staff and the staff of the Institute's two "special laboratories," a task force has recommended a very strong program for increasing the number of minority applicants, trainees, and employees.

Specifically, the *Ad Hoc* Task Force on Equal Employment Opportunity, chaired by Jack P. Ruina, Vice-President for Special Laboratories, said that the Institute must raise the number of minority group (black, mainly) employees to a ratio similar to the national ratio of 11.5 per cent black to non-black population. At present, the total non-academic staff of M.I.T. is 3.7 per cent black.

A seven-point-program to accomplish this was outlined in detail:

1. M.I.T. must increase the number of minority group applicants and their accessibility to available jobs within the existing applying and hiring process. The 100-odd individual departments and offices which now actually interview and hire their own personnel should set specific goals for the next three years.
2. The Office of Personnel Relations, which traditionally interviews all applicants and channels them to the individual departments and activities, should be empowered to review and question the job descriptions given it by individual offices.
3. M.I.T.'s year-old Opportunities Development Office, headed by James C. Allison, should be empowered to "audit" specific hiring and promotion goals of the individual offices.
4. An increased budget should be allocated for advertising in black neighborhoods and strengthened contacts with Boston and neighboring cities' black communities.
5. M.I.T.'s two "special laboratories," Lincoln and Instrumentation, should expand recruiting at black colleges having science and engineering curricula and emphasize summer employment in programs where college students now receive on-the-job experience in their fields.
6. M.I.T. should develop two training programs, one to enable present employees to move upward in their present jobs or to train for another field (even if this means crossing union boundaries), and another to train potential employees from minority groups for jobs in the general area of research and development technical work.
7. The task force—or a similar group—should be reconstituted to meet in the spring and summer of 1970 "to review progress in every phase of the Institute Equal Opportunity Program and to revise and expand it as then appropriate."







M.I.T.'s two experimental "colleges" have one thing in common: their goal is to find a new way of education that will help each student develop according to his own individual potential. This means individual laboratory study sessions; but it also means organized seminars (as below, opposite, with Edward B. Roberts, Associate Professor of Management) to introduce new fields and new ideas. (Photos: Richard Koolish)

lead him into political science: studies of local and regional government, legislative problems, even constitutional law.

If he takes the first route, he will probably fulfill the Institute's requirements in physics, chemistry, and mathematics; if he takes the second, most of his work will be in civil engineering, political science, and humanities—and he will still have to fulfill the Institute's science requirements, either by taking the appropriate science courses or by independent study, motivated by the realization that basic science will indeed be important to his professional programs.

In either case, says Judah L. Schwartz of the M.I.T. Education Research Center, where the concept of U.S.S.P. was born under the general direction of Jerrold R. Zacharias, M.I.T. Institute Professor, there's a strong effort to encourage students to work on problems "with both human and physical dimensions."

After four weeks of the term, Dr. Schwartz reported that most of the 29 students in the Class of 1973 who chose to gamble on this "new college" are "just blossoming, learning stuff at a prodigious rate."

"It's hard to run fast enough to keep up," he observes.

### **"... Each Student to Develop According to His own Potential"**

*The following are excerpts from statements of principles and goals which guide the Experimental Study Group's program (see right) for a selected small group of first-year students at the Institute this fall:*

Because we recognize that students are very different from one another, we propose to foster diversity in education: to go as far toward an individualized program for each student as we can.

We believe that an excessively unstructured program could be as unwise for some students as a completely structured one is for some others. Thus we doubt that students who continue to need to have their educations completely planned for them, or their freedom to learn restricted to the privilege of selecting from among an assortment of scheduled subjects of instruction, will find this proposed experimental program congenial. Although we believe that planning of a student's activities is necessary, we envision that the student in the experimental program will create (and modify) his own plan as much as possible. If he becomes interested in some topic, then we want to show him how to delineate his own ignorance about it. After interest has been awakened and ignorance recognized, we believe learning can proceed rapidly.

We think the student should come to understand himself as well as his associates; to join group activity, or not to join, depending on the group's purpose and the student's own understanding of his needs and his potential for being helpful to the group; to learn how to cooperate freely with others; to learn how to search out information and how to judge it wisely, neither blindly rejecting the unpalatable nor blindly accepting that which is attractive; and above all to learn how to educate himself, guiding himself by consultation with others.

For its 29 students the "new college" has eight full-time and 15 part-time teachers. All the U.S.S.P. students and staff come together frequently at private "college" seminars, called by either students or teachers whenever they are ready to present a problem to their colleagues. Each student has an adviser with whom he confers at length on his progress and future plans at least once a week.

### **Their Own Thing at Their Own Pace**

George E. Valley, Jr., Professor of Physics, is the spark behind a similar—yet different—effort to encourage freshmen to "do their own thing" called the Experimental Study Group. Here, too, the emphasis is on self-directed study. But Dr. Valley proposes that students' learning will be more from books (of his own choosing), less from the laboratory. If a student wants to spend the whole term working on mathematics, fine. But he is likely to be encouraged to dive into physics and chemistry.

His stimulation comes chiefly from being able to go as far as he wants into a subject, at his own pace—to set his own style of education which responds more to the strategy of science than to its formal content. For example, Professor Valley cites the case of the freshman who came to him asking, "Why did you become a physicist?" "You can't ask this kind of question of your ordinary faculty adviser," said Professor Valley.

E.S.G. has enrolled 38 freshmen who make their headquarters in the penthouse of an M.I.T. academic building. There are 11 upperclassmen as tutors and nine instructors, a small laboratory, library, kitchen, computer console, and recreation room.

The importance of both programs, says Dr. Schwartz, is that they provide alternatives to the conventional lecture-recitation-quiz system of learning. The programs are ideal, he thinks, for those students who are mature enough to want to be enthusiastic about a subject and want to work at it. With a conventional M.I.T. first-year program, Dr. Schwartz says, such a student taking five courses is so busy he cannot afford to be interested in any one of them, a situation in which he says study has "negative survival value" for this kind of student. The point of this year's two experiments is to provide alternatives for those who need them, and the fact of alternatives may be as important as their form.

# The Medical School Muddle

Leon S. White, Associate Professor in M.I.T.'s Sloan School of Management, has learned the hard way what turns out to be a fundamental lesson in politics: some times are better than others for asking questions and proposing change.

Professor White's lesson began last spring when he was asked to prepare a report on alternatives for state medical education in Massachusetts for Governor Francis W. Sargent.

When Governor Sargent took office last January, a new University of Massachusetts Medical School and teaching hospital to be built in Worcester was already planned, designed, and partly financed. However, Professor White was charged with studying three alternatives to that plan and the plan itself. To these he added a fifth possibility proposed by himself.

When Professor White submitted his report in early June, the Republican governor ran up against solid Democratic legislative support for the Worcester plan. Moreover, the Republican members in the Massachusetts legislature favored re-examining the finances of the present plan (in two years its cost had escalated by \$79 million) rather than considering any of the other alternatives. Within days, Professor White was accused of politicking because he proposed a fifth system which would have spread medical education throughout the state rather than centralizing it in Worcester.

Thus, within a week, Herbert Black, a medical writer of the *Boston Globe*, called the fifth alternative a "dud." The Dean of the University Medical School went on television to tell the public just what he thought of Professor White and his report. The *Worcester Telegram* inveighed heavily against the report—contending that Professor White, a systems analyst, had "no known medical background."

Professor White's view was that he was charged with developing a cost-benefit analysis for the Governor consistent with state objectives. Thus, he decided that it was inappropriate for him to enter the fray and counter objections to the report.

The dénouement? Subsequently the Governor appointed, with Professor White's help, an out-of-state panel of experts in medical education to decide the question. In the course of their deliberations they decided there were two alternatives left: either to proceed with the Worcester plan or to call it off entirely and start all over again. Since a new medical school was badly needed soon, they decided they couldn't call the whole thing off; thus the state should proceed as planned.

Professor White's moral: "If you are going to do an analysis of an innovative approach to a governmental problem, you'll have better chance for support of your conclusions if you can reach politicians of importance before they have hardened their positions to the point where they can no longer listen."

## I.C.B.M.'s in Your Back Yard

Among the other surprises which the current interest in the arms race and arms control has brought to light is a slightly stooped, shuffling, 22-year-old wizard of the missile business, Russell M. Seitz.

Mr. Seitz made headlines last summer with the announcement that, in an old brick house in the South End of Boston, he had gathered two-thirds of the parts—including all the essential ones—of an intercontinental ballistic missile (I.C.B.M.), and that all he needed was some casing and piping (easily

obtainable) and 500 man-years to assemble them, and he would be ready to launch.

Was it some fantastic plot? Was it the old science fiction (read: fission) day-dream (read: nightmare) of the mad scientist who threatens the country from a musty attic? No. In fact, Russell Seitz, who has been inventing and patenting various devices relating to chemistry and metals since the age of 14, started collecting the parts simply to obtain the "exotic" metals of which they are made.

But when he realized that he could get four complete, perfect, Titan II-C engines—test-fired and ready for use—from a Massachusetts surplus dealer for under \$100 each, no questions asked, he decided that there must be something wrong with the military security system governing the disposal of obsolete, but perfectly usable, missile parts.

Thus he set about finding the rest: an Atlas nose cone for 40 cents a pound, a complete guidance system ready for assembly and other components at dumps in Taunton, New Bedford, Salem, and North Cambridge. So he went to the public press with the aim of telling the Army that it should clamp down; more security was needed, he thought, because if he could do it so easily, so could others on behalf of other nations, including the other nuclear powers who can build warheads but have no satisfactory way of launching them.

Mr. Seitz, who labels himself one of the "few" conservatives at M.I.T., firmly believes that his feat proves the need for the anti-ballistic missile system (A.B.M.). "The system is sufficiently viable to merit its deployment," he says. And it is designed to counter a great number of incoming missiles, which would be the case if a smaller country could launch warheads towards the United States.

"It proves that the people who are now talking about technological proliferation are about five years too late," he said. "Knowledge, as well as the physical parts to these things, are being distributed much faster than anyone thinks."

Mr. Seitz was a protégé of the late Warren S. McCulloch of M.I.T.'s Research Laboratory of Electronics, who brought him to M.I.T. three years ago as a special student and a research affiliate (he does not have a college degree and enrolled this fall at Harvard as a junior). Since his summer announcement, Mr. Seitz has gone back to work on crystals, and he has patented a fine-gradient medical thermometer which uses color change as an indicator of temperature. This brings his total number of patents to somewhere over 30. He is, among other things, the broadsword champion of the U.S., and plans to learn to play a recently-acquired clavichord.

*Russell Seitz, who collected the key parts to an intercontinental ballistic missile from local surplus dealers—no questions asked—demonstrates a sculpture he made by stacking mechanical parts—most of them unrelated to his I.C.B.M. (Photo: Richard Koolish).*





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# Special Report

## Toward a Definition of Research Responsibilities

John C. Sheehan, Dreyfus Professor of Organic Chemistry at M.I.T., has been named by President Howard W. Johnson to head the standing committee which will review activities of M.I.T.'s special laboratories; such a continuing consideration of programs and proposals was recommended by the Institute's Review Panel on Special Laboratories (see *Technology Review for June, 1969, pages 72A-72B*) "as a means of providing the President with the considered advice of students, faculty and laboratory staff."

Other members of the new committee include Peter Elias, Professor of Electrical Engineering; Andrew Gilchrist, III, third-year student in the Department of Chemistry; Robert L. Halfman, Deputy Head of the Department of Aeronautics and Astronautics; David G. Hoag, Associate Director of the Instrumentation Laboratory; Michael J. Marcus, graduate student in the Department of Electrical Engineering; Edward W. Merrill, Professor of Chemical Engineering; Walter E. Morrow, Jr., Assistant Director of Lincoln Laboratory; Carl F. J. Overhage, Professor of Engineering; and Hans-Lukas Teuber, Head of the Department of Psychology.

In his letter to Professor Sheehan confirming the assignment, President Johnson said that the committee's task "is to help us refine the criteria by which we measure M.I.T.'s interest" in various options which may be open to the laboratories. "We shall seek to build over a period of time an understanding of the ways in which this institution can best serve in its educational and research functions and in its responsibility to society," he wrote.

## A Feasibility Test of Research Conversion

M.I.T. has reached the point of "policy change" in its direction of the two large laboratories (Lincoln and Instrumentation) which have been operated for the federal government for over two decades. President Howard W. Johnson has given the M.I.T. faculty a plan to deemphasize the development of operational weapons systems while research in basic technology related to defense continues and work applying high technology to domestic and social problems is expanded, and the faculty has approved a test of its feasibility.

In a policy statement to the faculty, President Johnson said that "the special laboratories will continue to do fundamental research and to develop new technology in the fields of communication optics, guidance and control, radar systems, geophysical systems, and computer design and applications. However, the laboratories will not assume responsibility for developing operational weapon systems based on these concepts, nor will either laboratory assume responsibility for the field testing or production of specific weapon systems.

"This policy does not preclude the assumption of total system engineering responsibilities in defense systems other than weapons and in other fields such as space, medicine, transportation, education or urban systems if it should appear to be desirable to do so."

In addition, said President Johnson, "I want very much to see our work applying high technology to domestic and social problems expanded in the laboratories just as it has been on the campus. . . . To this end I have pressed hard and continuously for a major foundation grant; I have approached the Executive Branch of the government, and I have had discussions with many members of Congress, government agencies, and potential sponsors of various kinds.

"But it must be said," President Johnson continued, "that we are pursuing the most difficult of courses in which there can be no instant success. The feasibility of these two interlocking goals—basic technology related to defense and domestic technology—will take some time to test. We must find out if the ideas for large-scale technical involvement in domestic problems can be expanded in this country."

A beginning has already been made. Instrumentation Laboratory's Division of Scientific Technology has collaborated in a number of academic projects since its initiation two years ago: support to the Woods Hole Oceanographic Institution in the engineering problems associated with a major mid-water offshore ocean current program; design, construction and development of a major oceanographic instrumentation array off Bermuda in collaboration with the M.I.T. Department of Earth and Planetary Sciences; the development,



construction, and check-out of novel soil mechanics instrumentation in support of the soil mechanics division of the Department of Civil Engineering; design, engineering and construction of a bio-telemetric instrumentation system in collaborative support of a project in the M.I.T. Center for Life Sciences; a collaborative project with the Department of Metallurgy and Materials Science and the Harvard School of Public Health on computer control of an electron microscope for particulate matter identification and monitoring; the engineering, and construction and installation of a Beneoff Tilt-meter instrument at the Aggasiz Seismology Station in Harvard, Massachusetts, in support of the Department of Earth and Planetary Sciences; and full partnership with the Urban Systems Laboratory on CARS, a demand-responsive public transportation system.

The Instrumentation Laboratory has recently been asked by the Urban Systems Laboratory to collaborate in responding to a novel dual-mode transportation concept involving the CARS system with a line-haul automated highway link. This project promises to involve a major effort of the Instrumentation Laboratory together with a major involvement of faculty and students from many departments in an exciting and rewarding project of social consequence, according to a document prepared by the Review Panel.

Lincoln Laboratory facilities have had a prominent role in M.I.T.'s teaching and research in radio and radar astronomy for a number of years. Earlier this year, several studies were completed on possible non-defense programs in the fields of medical care, air traffic control, and computer-aided instruction. As a result of one of these, a program on medical care has been initiated in cooperation with the Beth Israel Hospital.



Cartoon: Paul Conrad from Register and Tribune Syndicate  
© 1969, the Los Angeles Times

"Man, that's really telling it like it is . . . !"

## Treading the Narrow Line: The First Week of November

The line between disruption and violence depends as much upon mood as upon law. Perhaps the single most remarkable fact about the demonstrations at M.I.T. on November 4, 5, and 6 is that, despite a two-month development of controversy and tension and the bright light of local and national news media, the action remained just below that critical point at which violence becomes an inevitable chain reaction.

A chronological review of developments at M.I.T. during September and October appears on subsequent pages of this issue. It demonstrates the gradual but unceasing development of what Dr. Benson R. Snyder, M.I.T. Dean for Institute Relations, calls a "supersaturated" community—a place where assumptions are less examined than argued, where each communication becomes a step leading inevitably to the next.

It was in this environment that Howard W. Johnson, President of M.I.T., chose on November 2 to ask for a temporary restraining order from the Middlesex Superior Court, making "violence, or the threat of force or violence, against persons or property" on M.I.T. premises an offense. "Since we cannot protect ourselves and still remain a free and open university," he told the faculty in reporting his action, "we have asked the whole of society to protect us."

### Tuesday, November 4

Blue, red and gray were the colors of the first day of November protests at M.I.T. The blue and red were the colors of the National Liberation Front flags carried by protesters from many groups in Greater Boston. Gray was the color of the weather—overcast skies, heavy rain alternating with drizzle—and of the spirits of many at M.I.T. who had thought that somehow this elemental kind of "confrontation politics" might be spared a school so largely focussed on logic and technique.

## A University's Vulnerability —and Its Inescapable Dilemma

*The following is the statement by President Howard W. Johnson to a special M.I.T. faculty meeting on Nov. 3:*

Of all the institutions in our society, the university is most nearly defenseless. It has to be. The university exists so that there may be somewhere a place for the courageous and direct confrontation of ideas. The free flow of ideas cannot take place in an atmosphere of *physical* confrontation; an open mind cannot long exist in the face of force and threat. It does not matter where force may come from—from the legislature, from the police, from the alumni, from outsiders, or, indeed, from the administrators. Once force crosses the threshold, the university is diminished.

It is clear to me that here at M.I.T. we cannot ourselves and with only our own resources deal with force or the threat of force. We are vulnerable; we were created vulnerable; and we will remain so as long as we are free.

### Grappling with Issues

Universities today are grappling with unresolved issues which are their lifeblood. We have such issues: student discontent with the current educational process; the relation of the university to society; the consequences of scientific and technological progress; the balance between study and action, just to mention a few.

Particularly, for a great institute of technology, we have the hard questions of how our capabilities relate to the defense of the nation. We struggle with that issue in its most emotional form, at a time when this country is fighting a war in which few of our students and faculty believe.

Our 8,000 students and 1,000 faculty work, study, teach, and do research that has no direct connection to military weapons. Quite the opposite, M.I.T. since its founding has made an immense contribution to the quality of life of this nation. It is our policy now to exclude secret research from the campus. No classified theses are being prepared. And we are currently engaged in a test of the proposition of whether we can move some of the technological capacity of our two off-campus laboratories to the problems of domestic and civil life. The faculty supports this test and will, I hope, participate actively in this effort. This is going to be a much tougher job than recreating the many academic laboratories after World War II.

In the area of education, we have created a commission of faculty and students to look searchingly at everything that M.I.T. does—all the way from how we teach and learn to how we govern ourselves—to see that what we do in the 1970's is responsive to the times and to human needs.

Those are some of the real issues within the Institute. This faculty, all of us, must  
*Continued opposite page*



*M.I.T.'s first exposure to a major threat of violence from radical students and non-students came on November 4, 5, and 6, when at least 250 members of the November Action Coalition encamped on the campus. "Buildings condemned under*



*Article 2, People's Code: All properties used for oppression are to be confiscated and returned to their rightful owners, the people," said the banner. But the action was more restrained than its protagonists' promises.*

Estimates of the numbers of demonstrators ranged from 650 to 250, of which perhaps 20 to 30 per cent were M.I.T. students. Their November Action Coalition represented a collaboration of many radical groups—the M.I.T. chapter of R.L. S.D.S. (see *Technology Review* for October/November, p. 93D), S.D.S. chapters from other Greater Boston schools, the Black Panthers, the "Weathermen" faction of S.D.S., and others. Their goal—to "stop war research"—was to be achieved on Tuesday by demonstrations at the administrative offices and the Institute's Center for International Studies.

In the middle of the afternoon, following noisy rallies at both locations, the protesters reconvened in the Institute's main entrance rotunda to consider their next steps. A proposal to follow the original plan—occupation of the President's office (it was locked, the President and his staff having moved to work in less vulnerable quarters)—was defeated; and the protesters returned by way of the Instrumentation Laboratory to "teach-ins" and a strategy session for Wednesday.

### Wednesday, November 5

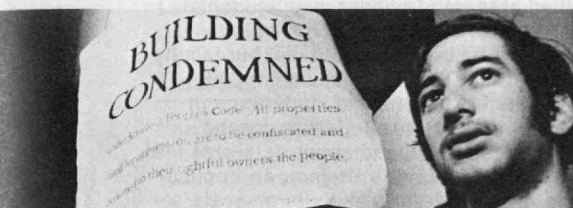
Like most of the streets in the industrial section of Cambridge around M.I.T., Osborne Street is narrow, unplanted, and shabby. It is more an alley than a street.

By early Wednesday morning it was occupied by nearly 300 young people picketing to deny access to the employees of M.I.T.'s Instrumentation Laboratory who work in Building IL-5. IL-5 is the site of work on a guidance system for the Poseidon (multiple-warhead) missile. But an "obstructive" picket line is illegal in Massachusetts, and after Cambridge officials determined that entry to IL-5 was in fact obstructed and issued several warnings, the police force from several towns were ordered into action.

At 9:10 came the scene so familiar to television viewers yet so incredible to M.I.T. Approximately 200 police carrying riot clubs held in two hands (supported by a smaller number of police with carbines, tear gas guns, and dogs—none of whom saw action) began a slow march up Osborne Street. The demonstrators retreated, turning down a side street; the police charged. Some people fell; some came up swinging. The police reformed their line and resumed an orderly pursuit, and two blocks away, at the corner of Windsor Street and Massachusetts Avenue, the demonstrators dispersed.

The news media characterized the demonstrators' behavior as restrained,





the police as "orderly and well disciplined." There were reports of isolated incidents; there were 10 injuries—none serious—and one arrest. The November Action Coalition claimed victory on the basis of having closed their target building of the Instrumentation Laboratory for two hours; but several individuals and one group—the Black Panthers—deserted the coalition during the afternoon.

#### Thursday, November 6

Tuesday was March Day; Wednesday was Police Day; and Thursday was Sit-In Day—when at least 100 members of the N.A.C. held a sit-in in the corridor outside M.I.T.'s main administrative offices for over two hours.

Thursday's actions began with a noon joint rally sponsored by the Science Action Coordinating Committee—an all-M.I.T. radical group which had not participated in the Wednesday picketing—and N.A.C. Jonathan Kabat spoke for S.A.C.C., saying that the question of violence "distracted from a discussion of the main issues." He said S.A.C.C. sought a "broader base of support" instead, and would canvas the halls of the Institute to explain their position to others that afternoon, instead of joining N.A.C. in their sit-in.

The sit-in did not stop administrative functions; the offices were locked and those who normally work there had simply moved elsewhere. Indeed, throughout the Institute—as during both previous days—classes and business continued normally.

#### Maintaining the Cohesiveness

When the week was over, President Johnson told a press conference that M.I.T. seemed to have come through the week "without large damage to its fabric—and with some new strengths. Can we maintain a measure of the cohesiveness we have achieved this week without minimizing the wide range of views held in this community?" he asked.

On November 11 the President announced that two review panels composed of faculty, students, and staff would be established to help the officers of M.I.T. investigate "possible unlawful and inappropriate behavior" by students, non-students and faculty members between November 3 and 7. Violations of the Court order remain subject to possible legal action, and disciplinary action in the case of M.I.T. students seemed probable.

try to understand them, to propose effective policies, to press forward toward resolving these issues.

#### Threats of Force

But these are not the issues that we face this week, when there are explicit and implicit threats of force before us. We are being told: do what we ask you to, now, or suffer violence. Because we are what we are, because the Institute is what it is, the November Action Coalition has faced us with a real dilemma—an inescapable dilemma. They have used our vulnerability and to seek to force us into a position where we must be damned if we don't use force and damned if we do.

I have had no lack of counsel these last few days. I have met many times with groups of our faculty and students. I have talked with innumerable individuals. It has been our purpose throughout to face these threats together, because all of us are responsible for the future of this great institution. I have found that the M.I.T. community is united in its determination to protect M.I.T.'s fundamental rights.

I have been advised to do nothing; but that, in my judgment, would only briefly postpone the test. I have been advised to call in large numbers of the police at once and be done with it. That might appear to be an answer, but I believe it would diminish the Institute unless police were required to protect individuals against injury. Most of the advice, of course, fell between these extremes. I want to report to you now that, last night, I decided to take the step which I believe is the most reasonable.

I have asked for and received from the Superior Middlesex Court a temporary restraining order against those individuals and groups who have indicated their intention to commit acts that are sure to lead to violence on this campus. The restraining order enjoins individuals and groups from "employing force or violence, or the threat of force or violence, against persons or property."

Such acts, with the issuance of the restraining order, become acts against the Commonwealth, to be dealt with by the Commonwealth. In effect, since we cannot protect ourselves and still remain a free and open university, we have asked the whole of society to protect us.

For the Institute to function, those who are members of the Institute must be free to come and go without hindrance; they must be free from threats of bodily harm; and their working tools and places must remain unharmed and at their own disposition. It is those rights, which are civil rights common to all of us—and only those rights—that I have asked the Court to protect. Obviously, I have not asked—nor would I ever ask—the Court to restrain anyone's right to dissent and protest. But it is time now to look beyond November 4, and to make sure that M.I.T. will be a place where the real issues will begin to be resolved in a community where the right to build is at least as secure as the right to criticize.



# The First 70 Days—A Chronicle

## September 7

### Ho Ho Ho Chi Minh!

The season of discontent begins when some 15 M.I.T. students and others briefly disrupt a dinner of the 1969 Alumni Seminar with a snake dance and chants of "Ho Ho Ho Chi Minh" and "end war research." They insist that as long as the war continues there can be "no business-as-usual, no parties at M.I.T." (see *Technology Review* for October/November, page 114).

## September 15

### "You're Going to Be Disturbed by Action"

Michael A. Albert, '69, President of the M.I.T. Undergraduate Assembly (student government) greets M.I.T.'s new class of 1973 with an emotional attack on imperialism and its support by M.I.T. through war research sustained by the financial interests of members of the M.I.T. Corporation. He ends by promising, "I don't want to talk anymore, so you people aren't going to be disturbed by talk. You're going to be disturbed by action."

## September 21

### "Closing Down the Campus . . ."

Speakers at the organization meeting of the Rosa Luxemburg Students for a Democratic Society (R.L. S.D.S.) say the group will act against M.I.T. war research "until the cost of keeping it is higher than the cost of ending it." They promise city-wide action in November at M.I.T. which "may go as far as closing down the campus for a day or two."

## September 24

### "The Right to Express Our Views"

On this first day of the term, President Howard W. Johnson writes to all members of the M.I.T. community (see *Technology Review* for October/November, page 93C) that, though "we may disagree in the substance of our views, we must not disagree on the right each of us has to express them. I want to state, so that it is clear to all," he concludes, "that our procedure, in the face of coercion or threat to the freedom of this campus, will be to call for immediate review and action by the appropriate judicial group."

## October 3

Several M.I.T. undergraduates, among them radical students having strong views on the war and war research, have been invited to attend a part of today's annual meeting of the M.I.T. Corporation to discuss plans to make October 15 (Moratorium Day) a day "for thought and affirmative action." Instead, this morning some of those invited join their groups in a rally and a march to the site of the Corporation meeting, and the radicals insist that all be allowed to enter. There is noise, confusion, and profanity; then shoving against guards, faculty, and administration members outside the door; and a compromise by which some 20 of the demonstrators are allowed in to the meeting room while their colleagues listen to the proceedings outside through a public address system. A faculty review of the episode, which may lead to disciplinary action, is arranged.

## October 5

### ". . . the Second Pentagon"

Michael Albert writes in the *Boston Globe* today: "In early November there will likely be city-wide demonstrations at M.I.T. . . . M.I.T. is the Second Pentagon. . . . At M.I.T. in November we will protest the war, protest imperialism, support the N.L.F., and put an end to the machinations of the Second Pentagon."

## October 9

The Faculty Committee on Discipline reports today that it has placed five students under "admonishment" and one on "probation" as a result of their acts at the Alumni Seminar meeting on September 7. It is the first time that details of such a decision by the Discipline Committee have been made public.

## October 10

Following a noon rally at the Student Center, some 150 students this afternoon engage in a non-violent "mill-in" at the Center for International Studies offices in the Hermann Building, where they engage members of the faculty and staff in lengthy argument and discussion of C.I.S. activities. Some students charge—and faculty deny—that clas-

sified research is under way; students ask to take some documents which they find by inspection of files, but faculty request that they use documents only while here—or return to study them in detail in the future. Professor Joseph C. R. Licklider, asked about details of the so-called Cambridge Project, an application of computers to study large-scale social problems, suggests that students who are interested attend the planning meetings; a similar offer was made last year, he says, but no students have come.

After two hours all students leave peacefully, but Philip Raup, a former M.I.T. graduate student, announces that if certain C.I.S. projects are not terminated by November 4 he and his colleagues will return to stop them. Robert L. Bishop, Dean of the School of Humanities and Social Science, admits to *The Tech* that anticipating the afternoon "we were afraid of something that would have the accent purely on disruption, and this was not the case. I look upon this as an open house."

## October 19

James K. Glassman, *Boston Herald Traveler* reporter, writes today that a new coalition of anti-war groups—the November Action Coalition—will direct "militant, disciplined action" against M.I.T. war research projects on November 4. Mr. Glassman lists these groups as participants: radical committees at 20 Boston-area colleges; the Black Panthers; the Mass Liberation Front, a high school group; the Committee of Returned Volunteers, a radical Peace Corps group; the South End Squatters movement; Bread and Roses, a Cambridge women's liberation organization; and S.D.S. chapters at Harvard, M.I.T., Northeastern University, and Boston College. "Although the action has not been specified," writes Mr. Glassman, "it will probably include sit-ins and militant picket lines to prevent faculty and students from entering buildings to do the (war research) work."

## October 21

Prodded by R.L. S.D.S. threats to Instrumentation Laboratory, a group of the Laboratory's staff and employees organize a discussion of issues in Kresge Audi-

torium this evening. Among the highlights of the six-hour meeting: William G. Denhard, Associate Director of the Laboratory, decries "convert and open attempts to lay guilt at our doorsteps for all the world's problems." He declares his commitment to defense research to maintain a free and open society. C. Stark Draper, Director of the Laboratory, places his faith in a "balance of respect." Given a strong defense, the nation will have time to tackle its most basic problems. The evening is enlivened when a young woman, with three other members of the "Weatherman" S.D.S. faction standing at "parade rest" behind her, declares that imperialist America is suppressing the revolutions of the "third world." She warns of "a very hard struggle" coming and promises that the Instrumentation Laboratory "is not going to be safe again."

## October 22

### "An Extremely Serious" Matter

President Johnson tells the M.I.T. faculty today that reports in the public press about "coercive action that is to take place at M.I.T. in the first week in November" represent "an extremely serious" matter. He says:

"The fact that such statements have been made changes the context in which we operate. Whether these threats materialize or not, they have already affected the level of trust we have in each other, they have begun to limit our ability to communicate, and they make it increasingly difficult to discern between legitimate protest and potential destruction. . . . If such threats continue to be made and if it appears that such action will materialize, I would feel it necessary to call upon the civil authorities for help in advance of the carrying out of such explicit threats to burn to break, or push, or stop." (*The full text of the President's statement appears on Page 96 A.*)

The President receives a nearly-unanimous standing ovation from the faculty at the end of his statement.

### "A Point of Policy Change"

In a separate statement to the faculty today, President Johnson declares that M.I.T. is "at a point of policy change" in the direction of its two so-called "special laboratories" supported principally by the Department of Defense. He asks faculty support for a test, between now and next May, of the recommendations of a student-faculty panel to see "if the ideas for large-scale technical involvement in domestic problems" can be realized for these organizations (see page 96).

## October 27

### "We Will Take Militant Action"

R.L. S.D.S. today describes seven "projects that we demand be terminated:" Project PRESS at the Lincoln Laboratory, a program of research in reentry physics which S.D.S. says is "an A.B.M. research project;" work on a guidance system for the Poseidon weapons, includ-

ing multiple, independently targetable reentry vehicles (M.I.R.V.'s) at the Instrumentation Laboratory; research on an all-weather guidance and stabilization system for helicopters in the Instrumentation Laboratory; research on a "moving target indicator" radar at Lincoln Laboratory; research on communications and international security ("psychological warfare," says S.D.S.) in the Center for International Studies; and the Cambridge Project to apply large-scale computation facilities to social science research in the Center for International Studies. "No amount of police action will ever stop the movement to end imperialist research. We will continue our struggle until we win," says the S.D.S. pamphlet.

In the same leaflet, R.L. S.D.S. says that President Johnson in his October 22 statement "grossly misrepresented the nature and meaning of the action" proposed for November 4. "We do not intend to do physical property damage to any part of the Institute. . . . Under no circumstances will we initiate violence against anyone during this action. . . . (But) within these guidelines, we will take militant action next week to stop the projects listed in our demands."

### Ad Hoc Faculty Advisers

W. Ted Martin, Chairman of the Faculty, writes to each Department head at M.I.T. asking him to designate "one faculty member from his department who does not have other administrative duties . . . with whom I could discuss the various issues ahead of us." J. Daniel Nyhart, Dean for Student Affairs, appoints a similar group of students, and the two form an *ad hoc* group which meets constantly during the following week.

## October 28

### "A Free Atmosphere Is Vital"

The M.I.T. General Assembly, the undergraduate student government, tonight approves a "policy statement" saying that "a free atmosphere is vital to the conduct and function of a university." The statement condemns "physical attacks on M.I.T. students and staff, prevention of free access to . . . offices or classrooms, theft or destruction of . . . property, . . . (and) forcible ejection of any M.I.T. personnel from their places of work or study." Noting that "there is a present danger of violent confrontations, and . . . that factions outside the realm and jurisdiction of the M.I.T. community may be involved," the General Assembly resolves by a vote of 34 to 20 to "condemn all acts of violence directed against M.I.T. . . . (and to) support the use of appropriate means, including calling in the civil authorities . . . to prevent or stop all acts of violence."

## October 29

### A Placement Office Confrontation

Some 40 students and non-students appear at the M.I.T. Placement Office to demand that interviews cease with representatives of the General Electric Co., against which a nationwide strike is in

progress. The students are asked to designate representatives to be admitted and discuss the issues with the Director of Placement and faculty members present; they refuse; there is near-violence during which one faculty member is struck in the face; and finally the students leave upon being warned by Kenneth R. Wadleigh, M.I.T. Vice President, that disciplinary action in the case of students and court action in the case of non-students will be undertaken if they remain. A special faculty committee is named to review the episode for the Committee on Discipline.

## October 30

### "We Support These Demonstrations"

M.I.T. members of the New University Conference, a national organization of academic faculty, graduate students, and staff, announces today in an unsigned handbill that "we support these demonstrations (planned for November 4) and will participate in them." The demonstrators, says N.U.C., "do not believe that the war is simply a 'tragic mistake.' They believe it is part of a general system of oppression which characterizes U.S. policy today: the control of rich over poor, of white over black, of men over women, of grant agencies over researchers. Why at M.I.T.? Because M.I.T. plays a large role in this system of oppression. . . . There exist no such creatures (as outside agitators). Humanity has a common fate: There is no distinction between M.I.T. people and non-M.I.T. people when everyone has the same stake in ending war research."

### "All Parties Must Submit to Discipline"

*Thursday*, an M.I.T. student-sponsored weekly newspaper, reports two additions to the roster of the November Action Coalition: the Boston "Weathermen" and Newsreel, a radical film-making group. Among requirements for joining the Coalition, writes Kevin H. George, an M.I.T. junior, is that "all parties must submit to the internal discipline of Coalition decisions. . . . N.A.C. states that it will initiate no violence on any person—faculty, worker, or student—or destroy any property."

Also in today's *Thursday*, Mark Kaercher reports on the growing stature of Young Americans for Freedom, a student organization whose aim is "to spread conservative ideas," and which "now considers itself to be on the offensive." He quotes Anthony J. Horan, an M.I.T. graduate student: a 40 per cent rise in regional Y.A.F. membership in October.

## October 31

### M.I.T. "Is Unlikely to Fragment"

Analyzing the situation in *The Tech* today, Steven C. Carhart, Editor, compares M.I.T.'s condition now with that of Harvard last April. "The most important difference is that the dissident organization has been speaking openly of violence for a long period of time. Violence is, for the moment at least, associated more with the radicals than the police or administra-



tion in the minds of most members of the community. This, coupled with the fact that the N.A.C. is mostly non-M.I.T. people, suggests that the M.I.T. community is unlikely to fragment as was the case at Harvard. This likelihood has been further reduced by the consultation procedures which the administration has set up with the various segments of the community."

## November 2

### "Some of the Better-Known Radicals"

Parker Donham writes in today's *Boston Globe* that N.A.C. organizers "hope to field at least 750 radicals . . . to take part in a series of disruptive sit-ins and picket lines at M.I.T." on Tuesday. "If these claims are not inflated," says Mr. Donham, "then M.I.T. may be in for as serious a crisis as has faced any institution of higher learning in this country since college demonstrations began at Berkeley, Calif., in 1964."

In today's *Herald Traveler* Mr. Glassman lists the N.A.C. leaders, including "some of the area's better-known radicals:" Michael S. Ansara, former leader of the Harvard S.D.S., now untitled editor of *The Old Mole*; Henry P. Norr, former Harvard student who is now a full-time radical organizer working for the New England Free Press; David I. Bruck, last year's Editorial Chairman of the *Harvard Crimson*, now on leave of absence to finish a book on the Harvard disorders; Michael Kazin, former co-chairman of the Harvard S.D.S.; Michael Albert, President of the M.I.T. Undergraduate Association; and George Katsiaticas, Chairman of the M.I.T. Interfraternity Council. "N.A.C. will go back to the old tactic of seizing buildings and waiting for the police to react," Mr. Glassman speculates.

### No Action, or too Much Action?

President Johnson calls a special meeting of the Faculty Council with the *ad hoc* student and faculty advisory groups this afternoon to consider policies for November 4 to 6. Marvin S. Keshner and Charles E. Mann, both M.I.T. undergraduates, say that "the leaders of N.A.C. don't intend that this be a peaceful protest." The leadership is quoted as asking "Haven't they realized yet that we are really serious? . . . I expect to be in jail Thursday morning, and I expect the students of M.I.T. to bail me out." Three faculty members involved in the confrontation outside the M.I.T. Placement Office last week recount the threats directed against them. Stephen C. Ehrmann, an undergraduate, says it is dangerous to have police on the campus but also emphasizes the danger to M.I.T. "if this situation isn't decisive. M.I.T. must provide the answer for many people." President Johnson ends the meeting by indicating his intention to "walk the path between no action and too much action." After the meeting, Stephen H. Kaiser, a graduate student, writes for an extra edition of *The Tech* that "faculty and administration attitude has hardened considerably since last Friday, and there is wide-

spread sentiment that police should be stationed on the campus." Mr. Kaiser also reports the development of an *ad hoc* student group "to aid in planning and information flow. . . . The group has been meeting on a more or less continuous basis over the week-end," he writes, "acting mainly to inform itself about legal processes, tactical implications, and the like."

### "To Refrain from Force or Violence"

Late this evening Judge Thomas J. Spring of the Middlesex Superior Court grants an order of the Court requiring certain named individuals, the November Action Coalition, "and all others acting in concert with them . . . to desist and refrain from employing force or violence, or the threat of force or violence" against M.I.T.; "damaging or defacing" property of M.I.T.; "converting without authorization any files, correspondence, records, or documents" of M.I.T.; congregating within M.I.T. buildings "in such manner as to disrupt or interfere with normal functions;" and "inciting or counseling others" to do any of these things. Jerome Sullivan writes in the *Boston Globe* that "the Court move is believed to be the first ever taken by a college or university in advance of a student uprising."

## November 3

### Rejecting the Weathermen

*The Tech* this morning reports that the November Action Coalition, meeting most of the day yesterday, agreed to keep its pledge not to initiate violence on November 4 or 5. The N.A.C. rejected Weatherman proposals for violent action and agreed instead on hanging "condemned" signs and the National Liberation Front flag on the Hermann Building, home of the M.I.T. Center for International Studies, and a "trial" of "designated war criminals" followed by their execution in effigy.

### "We Have Asked Society to Protect Us"

President Johnson tells a special meeting of the faculty that "there are explicit and implicit threats of force before us." M.I.T. is being told, he says, "Do what we ask you to, now, or suffer violence." In many conversations with students and teachers, Mr. Johnson says he has "found that the M.I.T. community is united in its determination to protect the fundamental rights of this institution." Accordingly, he announces the temporary restraining order from the Superior Middlesex Court (see above). "In effect," says Mr. Johnson, "since we cannot protect ourselves and still remain a free and open university, we have asked the whole of society to protect us." A resolution that "this faculty support the President in taking the action that he has reported today" is approved by 344 to 43.

### "Chilling" Freedom of Speech

Federal Judge W. Arthur Garrity, Jr., this morning hears the November Action Coalition request that the court order be dropped, arguing that it has discouraged potential participants in the November Action activities, thus "chilling"

The cast of characters and the scenes of the drama make it easy to over-simplify the events of November 4, 5, and 6 at M.I.T. It is true that 200 demonstrators followed the flag of the National Liberation Front through the corridors and campus of M.I.T. chanting such slogans as "Ho Ho Chi Minh, the N.L.F. is going to win!", "Get out of class, get off your ass, end war research!", and "John Brown—live like him, dare to struggle, dare to win!" But it is also true that at the critical moments no one committed gross disobedience or violence.





their freedom of speech. The original order was based not on fact but on rumor of violence, they say. The judge denies the request arguing N.A.C. is not suffering "irreparable" damage in consequence of the injunction and that N.A.C. is enjoined only from doing those acts which it claims will not be done anyway.

#### "... To March and Shut Down ..."

The November Action Coalition issues a final statement about what will happen at M.I.T.: "As part of a week of activities, we are demonstrating at M.I.T. because it plays a large role in producing the weapons technology and strategies to perpetuate (the) system of oppression. . . . We are going to start with a rally at noon on November 4 in front of the Student Center . . . From there we are going to march and shut down the Center for International Studies and administration offices . . . Later we are going to hold a march to dramatize our opposition to other projects going on in other parts of the campus. That night we are going to turn the Student Center into an amazing center of discussion, films, music, speeches and rap groups. We are inviting everyone in the city to come and participate in discussions about all aspects of American life and policy. That night we will finalize our plans for shutting down the Instrumentation Laboratories the next morning."

#### Relying on the Institute's Record

President Johnson and Jerome B. Weisner, Provost, visit at least an hour late this afternoon with a number of undergraduates, including representatives of the student government, dormitories and fraternities. John G. Gaschnig, reporting the meeting, says that some students "express concern" that part of the Court order seemed to imply that students present only to observe or moderate activities of the demonstrators would be liable to Court action. In reply, Mr. Johnson remarks on the Institute's record of allowing peaceful protest in the past, adding that the injunction adds nothing to the law. When questioned about disciplinary action, President Johnson affirms that demonstrators could be subject to action by either (or both) the civil courts and (if students) the M.I.T. Faculty Committee on Discipline.

#### "We Want to Be Counted"

At least 300 students and faculty—including some representatives of the November Action Coalition—are participating in a "light a candle for peace" vigil beneath Alexander Calder's "Great Sail" stabile in the McDermott Court tonight. There are no speeches—only quiet conversation. The vigil was conceived by Randolph G. Hawthorne and D. Wayne Wenger, both undergraduates, as a call for non-violence: We are out "not to build an organization but to be counted. We will not support violence, and we want people to know it," they wrote.

When President Johnson arrives in McDermott Court tonight, he is presented with a petition "against November violence" signed by 1,700 members of the

M.I.T. community: "We believe that appropriate changes in Institute policy and operation can best be achieved through rational discussion and debate. Tactics of disruption and violent confrontation cannot help but set precedents which will endanger the future of the entire M.I.T. community. We oppose these tactics. Open and reasoned debate must continue. Only in this way can we preserve both our academic freedom and our ability to influence Institute policy."

#### November 4

"Institute hurtles toward confrontation," reads *The Tech's* headline this morning.

#### "Some Simple Principles"

At the second special faculty meeting in two days, President Johnson this morning tells the faculty that "how we bear ourselves today will determine the future of this institution." The faculty responds by confirming yesterday's support of the Court order and by approving "in principle" a resolution affirming "the right of its members, and of all members of the Institute community, to work actively for political goals;" calling for "a serious and fundamental reexamination of the Institute's research policies and operation, especially those that relate to the national defense and to war, during the coming months;" and condemning "attempts by members of the Institute community and by strangers to gain political objectives through the use of force or threat of force."

President Johnson announces that because the Hermann Building, which houses the Center for International Studies, presents "so many opportunities for physical violence and severe injury," he has asked its occupants to leave at 11 o'clock.

"We have stated some simple principles," says President Johnson to the faculty. "If we can abide by them today we will be stronger tomorrow." He urges the faculty "to stay close to the students today," and—following the President's suggestion—the faculty moves as a group following adjournment from Kresge Auditorium across Massachusetts Avenue and into the main buildings.

#### "Serious Misgivings"

At this morning's faculty meeting, one member of the faculty, speaking for himself and an unspecified number of his colleagues, expresses "serious misgivings about the use of the injunctive process and about specific features of the injunction obtained by the President." The language, they say, "might easily be construed so as to apply to . . . actions by members of our community who wish to express their agreement with the goals, though not with the means, of N.A.C. . . . We strongly urge the administration to avoid the use of this injunction."

#### "To Find Out What is Going On"

An all-campus information center, operated chiefly by undergraduates, opens

this morning in the center of the main M.I.T. buildings. It will gather, post, and relay by telephone whatever information reaches it—24 hours a day—about the November Action for the remainder of the week. Later Mr. Keshner, its chief protagonist, is to recall, "I cannot tell you how startling it is to see the President of M.I.T. walk in here to find out what is going on and how M.I.T. is doing!"

#### "Don't Talk With Pigs!"

The November Action Coalition issues some tactical suggestions to its members: "Proper dress: well protected, free to run and move. Leave everything behind that you normally keep in pockets or handbags; but *do* take a dime with you. . . . At the time of arrest, . . . memorize your arresting pig's badge number. Don't talk with pigs! Answer questions about yourself—name, address, age, occupation, etc. Answer no questions about the Action, what you're charged with, or the Movement. If you've been hurt, insist that you get medical aid. Get this as soon as possible to support later claims of excessive use of force. . . . You are entitled to complete (repeat: *complete*) one phone call; have a dime with you. . . . Decisions about how to defend ourselves in court legally and politically will have to be reached collectively. Ultimately, the only defense is the success of our Movement. Using the law is only 'first aid'—to keep us going until we win."

#### "Crimes Against Humanity"

The November Action Coalition rally at noon today on the steps of the M.I.T. Student Center is interrupted by a down-pour of rain, and several hundred protesters cross into the main entrance lobby of M.I.T. to the accompaniment of thunder and lightning from an unseasonable electric storm. Soon the group, now estimated at 400, is moving through M.I.T. corridors. Graduate student members of the Science Action Coordinating Committee (S.A.C.C.), not a part of N.A.C., remain outside the President's office (which was locked, the staff having moved elsewhere) and later adjourn to a larger area for conversations with Dr. Wiesner. N.A.C. proceeds to the plaza in front of the Hermann Building, where a "revolutionary tribunal" finding Professors Max F. Millikan, William E. Griffith, Ithiel D. Pool, and Lucian W. Pye, all members of the Center for International Studies, guilty of "crimes against humanity" is reported.

Their oratory finished, the N.A.C. group now rejoins S.A.C.C. in the main buildings; there is a long discussion of tactics and plans in the lobby, during which occupation of the President's Office is proposed and rejected. The protesters finally conclude to march past the Instrumentation Laboratory and return to the Student Center; there is a massive traffic jam but no violence and no disruption of Instrumentation Laboratory work.

The evening in the Student Center is devoted to slides, talks and tactical planning for tomorrow's action against the Instrumentation Laboratory.

Norman Sidney, Chief of M.I.T.'s Campus Patrol, estimates the number of today's "active protesters" at less than 250—with the number of additional on-lookers varying between 100 and 350.

#### "Common Sense and Restraint"

At the end of the day, President Johnson issues a statement: "I am proud of the common sense, restraint and commitment to the Institute shown by the faculty, students and staff of M.I.T. today."

#### "Only Such Police Effort as Necessary"

At an M.I.T. meeting this evening, R. Wells Edelman, an undergraduate, reports on city policy in connection with the demonstrators' threat to picket the Instrumentation Laboratories tomorrow morning, as outlined to him by James L. Sullivan, Cambridge City Manager. He points out that, according to state law, picketers must keep moving and must be three feet apart; otherwise they are illegally obstructive. Since the Laboratories are on public streets, the city is responsible for law enforcement. If the law is broken, Cambridge officials will call for only such police effort as is absolutely necessary to break up the picket, i.e. if it can be accomplished without arresting anyone, no one will be arrested. If it takes one arrest, one will be made. The police will not pursue a retreating crowd unless the crowd is physically attacking the police or other persons as it retreats. Only under the authority of President Johnson will the police step in on activities on the M.I.T. grounds, except in the case of general violence.

President Johnson, at a meeting with a group of students and faculty tonight, says that M.I.T. will not call on police at the Instrumentation Laboratories tomorrow. The matter will be left to personnel of the Laboratories and to the police themselves, he says.

### November 5

Throughout this week, Paul E. Gray, Associate Provost of M.I.T., is providing "briefing sessions" twice daily in Kresge Auditorium to summarize events and activities. This morning he reports that 20 to 30 per cent of the anti-war protesters who spent last night in the M.I.T. Student Center were Institute students; he says some 350 demonstrators left the building at 6:55 this morning to march to the Instrumentation Laboratory.

#### "Everyone Here Must Disperse"

At 7:30 this morning Edward J. Medeiros, an administrative assistant, attempts to enter Building 5 of the Instrumentation Laboratory, in which work on the Poseidon missile is concentrated; he is pulled away by pickets of the November Action Coalition along Osborn Street, one block from the M.I.T. campus. Shortly after 8, Philip Cronin, City Solicitor of Cambridge, and Richard Kline, Research Assistant in Chemical Engineering, a member of the Y.A.F. group at M.I.T., are knocked down while trying to enter the building. At 8:15 Cambridge Police Captain Joseph P. Cusak announces that

"everyone here must disperse from the area immediately. Failure to do so will result in arrest." At 8:45 Brock Dew, Assistant Director of the Instrumentation Laboratory, is repulsed twice but on his third effort succeeds in entering Building 5. Shortly afterward, Harold Ferrell, Head of Maintenance at the Building, attempts unsuccessfully to penetrate the picket.

At 9:10 about 200 police from Cambridge and Boston move up Osborn Street in formation; the pickets retreat. Robert Reinhold of the *New York Times* says the police action is "restrained with only brief outbursts of clubbing." Another reporter sees one policeman checked from violent action by his colleagues.

By 9:45 traffic is restored on Osborn Street and Building 5 of the Instrumentation Laboratory is open.

#### "Expected to Be Released"

At mid-day the M.I.T. Public Relations Office announces that 10 people were treated for injuries sustained at the Instrumentation Laboratory this morning. Three are identified as students, one is listed as a former student, five are listed as "not a student," and one is unidentified. As of noon, seven are described as "released," three "expected to be released."

Allan Fuchs, a former M.I.T. student in biology, is identified as the one person arrested at the Instrumentation Laboratory this morning. He is charged by Cambridge officials with disturbing the peace and unlawful assembly; bail is set at \$500 on each count, and Mr. Fuchs' attorney reports that bail is being arranged.

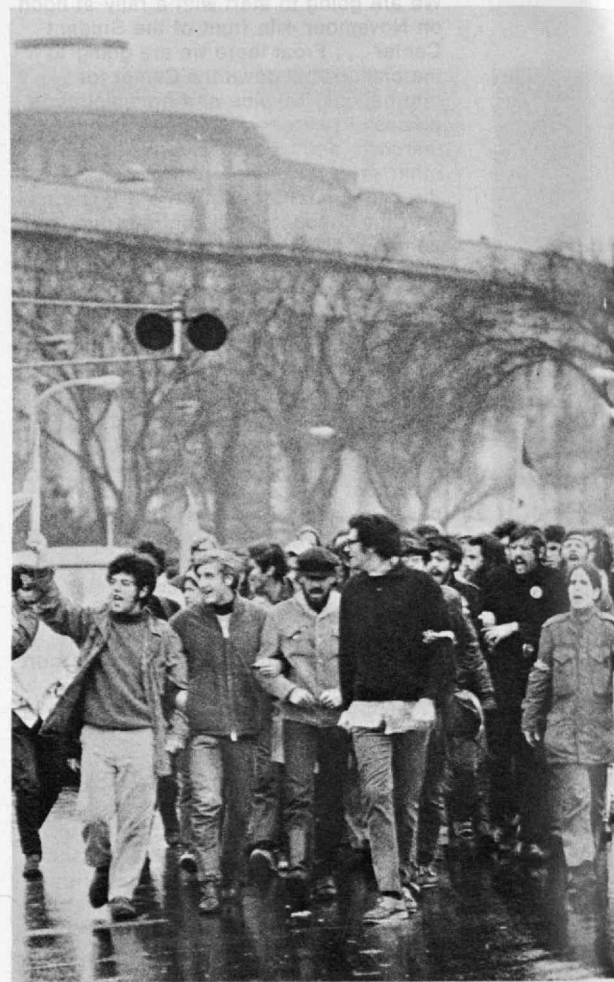
#### To Re-examine "War-Related Research"

An informal caucus of about 100 members of the M.I.T. faculty gathers in Kresge Auditorium this afternoon. Discussion centers on a proposed petition attacking the M.I.R.V. project: "The coincidence between the first diplomatic measures toward arms limitation and the serious re-examination of war-related research at M.I.T. gives us a special opportunity and responsibility. Let us at least defer all work to improve the accuracy of M.I.R.V. missiles. Let us, by a strong public statement, point out to Americans that such weapons do not add to our security, but undermine it." There is also considerable criticism of the morning's action against the pickets, and the meeting ends with some uncertainty about future action.

#### "Intelligent Terrestrial Life?"

A poster in the Department of Mechanical Engineering announcing a seminar on "The Possibilities and Probabilities of Finding Intelligent Extraterrestrial Life" is decorated . . . first by a ball-point pen asking, "How about some intelligent terrestrial life?"; later by a pessimistic felt marker: "Non-existent." Another S. D. S. poster has been decorated to read:  $A \int SDS = \frac{1}{2} ASS$ .

Events took a harder turn on November 5, when demonstrators marched from the M.I.T. campus to the nearby Instrumentation Laboratories, where they were confronted—and dispersed—by a combined police force ordered by Cambridge officials. November 6 saw some demonstrators in an obstructive "sit-in" outside M.I.T.'s principal administrative offices while others watched movies in the Institute's main lobby (right) and still others canvassed classes and offices "for support." But once more the pressure in the president's corridor stopped just short of the critical point.





### "To Prevent Work from Being Done"

Upon returning to the Student Center, the November Action Coalition issues a statement: today's picketing represents "the first time that the Movement has been able physically to prevent work from being done on a major war research project in this country."

### November 6

#### "... Not Alone in the Revulsion"

This morning the *Boston Globe* asks everyone in Cambridge to put away the bullhorns and listen to reason. Says the *Globe* editorial: "... The enlightened administration and the rebelling students are not nearly so far apart as some of the rebels sincerely believe. The *bete noire* at M.I.T. is the war in Vietnam, of course, but, more specifically, war-related research in university laboratories. But if the rebels would quit yelling long enough to listen, they would discover they are not alone in their revulsion. They then might desist from mindless activities which turn away others who also are convinced that university research should never be suborned by the military and that academic freedom goes down the drain when it is."

#### "Patience, Restraint, and Discipline"

President Johnson pays a brief visit this morning to the Cambridge Tactical Force which engaged in yesterday's action in front of the Instrumentation Laboratory. He tells them "how deeply grateful M.I.T. is for the patience, restraint and professional discipline shown by all of you yesterday morning. When tensions are high, it takes courage to be calm. I am sure the citizens of Cambridge are proud of you. I know we are." He also pays tribute to City Manager Sullivan and other government leaders.

#### "I Ask You to Permit Passage"

The Science Action Coordinating Committee and November Action Coalition together sponsor a rally in Kresge Auditorium this noon, with speeches about war research and photographs of the police action on November 5; the auditorium is nearly filled. Two hours later, as the rally ends, several hundred protesters march across Massachusetts Avenue, some to sit in the corridor outside the President's Office while some remain in the Institute's main rotunda and others (S.A.C.C.) fan out into the M.I.T. corridors and classrooms to engage passersby and classes in conversations. At 3:30 Dr. Wiesner speaks to those members of N.A.C. in the corridor: "I ask you to permit passage in this hallway. Please permit passage. This is a request." Several students and faculty, finding passage impossible, by-pass the corridor to reach their destinations. At 4:30 the protesters leave the corridor to rejoin those watching Vietnamese movies in Building 7, and the entire group returns to the Student Center.

#### "All Power to the People"

"We won a strong victory today," says an N.A.C. leader to the demonstrators as they return to the Student Center this

evening. N.A.C.'s objectives at M.I.T. were "to end seven imperialist war research projects now going on;" three were stopped on Tuesday, says N.A.C., when M.I.T. closed the Center for International Studies for several hours; one was stopped for part of the day on Wednesday at the Instrumentation Laboratory. "Today we brought our demands to the M.I.T. administration," says N.A.C., "shutting down its offices and making clear that we will continue to fight until our objectives are achieved."

"We are going to get stronger to crush imperialism in this country and all over the world. Victory to the N.L.F.! All power to the people!"

#### "We All Lose a Little"

Professor Gray, whose twice-daily briefings have made him "Mr. M.I.T." this week, confirms tonight that up to 100 protesters outside the President's Office this afternoon were "at times obstructive." He promises that M.I.T. students who participated will be considered for academic discipline and others may be subject to legal action.

Professor Gray emphasizes that in the past three days "there has been no substantive disruption of normal functions, classes went on, and the president is alive and well and says he has never administered so hard." But he notes that "confrontation politics is not a win-or-lose game. We all lose a little," he says, "when there is a violent confrontation, and we shall seek to avoid it in the future as we have in the past."

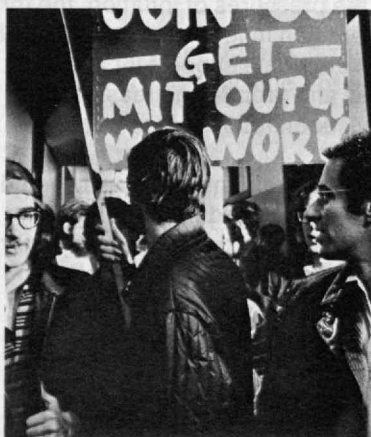
### November 7

#### "Sleeping or Dozing"

For the benefit of reporters who were not present, the M.I.T. Public Relations Office announces this morning that meetings and discussions of the November Action Coalition in the M.I.T. Student Center "began to come to an end about 2 a.m. and the group began to diminish, with the largest last element departing at about 5:30 a.m." By 7 a.m., the Public Relations Office says, 30 men and five women remained "sleeping or dozing" at the Center. Students present during the night said most people left the Student Center "with the intention of going to other campuses in the Greater Boston area" to recruit support for week-end activities in Boston.

#### "... Without Large Damage to Its Fabric"

President Johnson tells a special meeting of the faculty this afternoon that he believes "the Institute has come through these dangerous events without large damage to its fabric." Indeed, he says, we have gained by seeing "the form and substance of new patterns of communications" among us. The problem that lies ahead, he says, is to maintain "our cohesiveness without minimizing the wide range of views held in the community." He speaks of the *ad hoc* groups of faculty and students who have been his advisers this week: the students have





"maintained their own identity as students" but have joined effectively in the effort "to identify the on-going interests and values of this university. Seldom has my own personal admiration grown so rapidly in such a short time," he says to the faculty. And, he concludes, "We dare not forget that this week we have had even less time than usual to deal with the real issues, and the sooner we get back to them the better I'll like it."

As if to emphasize the dangers that lie ahead, the faculty is interrupted by members of the N.A.C. who wish to speak. There is a debate, during which the faculty's conscience is enjoined when Salvador E. Luria, Sedgwick Professor of Biology, asks them, "Can we finish this week with this kind of indication that this faculty refuses to speak to students?" Then they refuse by a narrow margin to modify for this meeting the rules on the privileges of non-faculty speakers. The erstwhile demonstrators leave.

Mr. Johnson reports to the faculty that the Court order was extended at M.I.T.'s request "to give us time to evaluate in detail what really happened. If there are actionable cases," he says, "I hope justice can and will be carried out."

#### "Discussion of the Real Issues"

At the faculty meeting this afternoon Professor Millikan reveals that even while the "disruptive sit-in" was occurring outside the President's Office yesterday the Center for International Studies had "some discussion of the real issues which I thought very encouraging for the future. I would think it unfortunate," he tells his faculty colleagues, "if the oversimplified charges led us to conclude that there was no problem in connection with how the Center operates and how its decisions are made, that there can be no bias from the nature of its funding."

#### November 11

President Johnson noted today that, though the Court's restraining order of November 3 was in fact temporary, violations would remain subject to possible legal action by the Court. And he said that two review panels, composed of faculty, students and staff, are being established to help M.I.T. officials evaluate complaints "regarding possible unlawful and inappropriate behavior" between November 3 and 7.

# The Present as Prologue To a Stronger Future

The ultimate issue is not campus violence, the Vietnamese war, or defense research. It is how, through the maze of present actions and reactions, to preserve the strength of American institutions for the future, said Howard W. Johnson, President M.I.T., in his annual report to members of the M.I.T. Corporation this fall. Tomorrow's opportunities will be strongest, he said, if we can maintain today "a spirit that embraces the will to improve with a blend of wisdom and compassion."

Though M.I.T. has traditionally been "deeply involved with the active concerns of contemporary man," said President Johnson, these concerns now are "swarming in upon us through every door and window"—a fact which represents a "profound change" in the role of the American university.

As a center of intellectual activity and as well of the nation's outstanding youth, the American university is seen "both as a model and a catalyst for social change." Strong commitment to change presupposes strong feelings—and possible conflict, Mr. Johnson warned. "But these same feelings provide the driving force to overcome the inertia of the past—to reform what has lost its usefulness, to renourish the part that gives life to the present, and to invent new ways, new alternatives to cope with the future," President Johnson wrote.

Will M.I.T. be wise enough in an atmosphere of conflict and change to choose the proper course and move along it effectively? Yes, President Johnson assured the Corporation, if we can resolve four issues now before the Institute:

1. Can the campus remain open to learning at a time when polarized views and political tendencies strain the delicate ties of trust and tolerance that form the basis for free and open exchange?
2. Can we establish a system of justice and a sense of fairness that will survive the test of these supercharged times?
3. Can the academic apparatus cope with technological and ideological changes and obsolescence in such a way that the educational process can stay relevant for students and at the same time retain its intellectual integrity? Can it stay supportive for the faculty? Can it stay responsive to the broader needs of our other constituencies?
4. Can the university maintain its vitality and momentum in the face of our present financial crisis?

On the fourth question, President Johnson wrote, "optimism is hard to generate at this particular moment." He cited the pressures of inflation, the threat of new tax legislation, and "the continued erosion in federal support for advanced work." Indeed, he said, "the lack of adequate support for ongoing fields and the unavailability of funds for new and promising areas will . . . approach the level of a national retreat if not soon relieved."

"There is much to be changed in our world," President Johnson concluded, "and we can do much to change . . . both priorities and practice. And we will, as long as the Institute emerges from the present into the future a stronger community, more effective in providing opportunity and more effective in responding to the new challenges."

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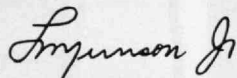
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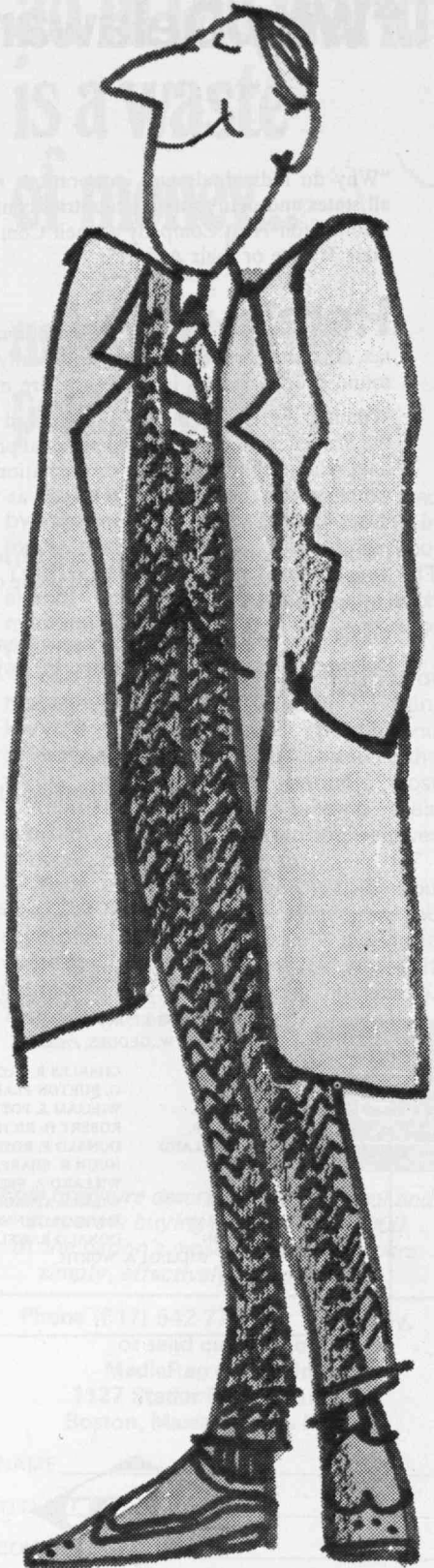
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# Institute Review

## The Slowing Rate of Growth

M.I.T.'s total operations increased to \$218 million in 1968-69—a 2 per cent advance—according to Joseph J. Snyder, '44, Vice-President and Treasurer of the Institute, in his annual report to members of the M.I.T. Corporation.

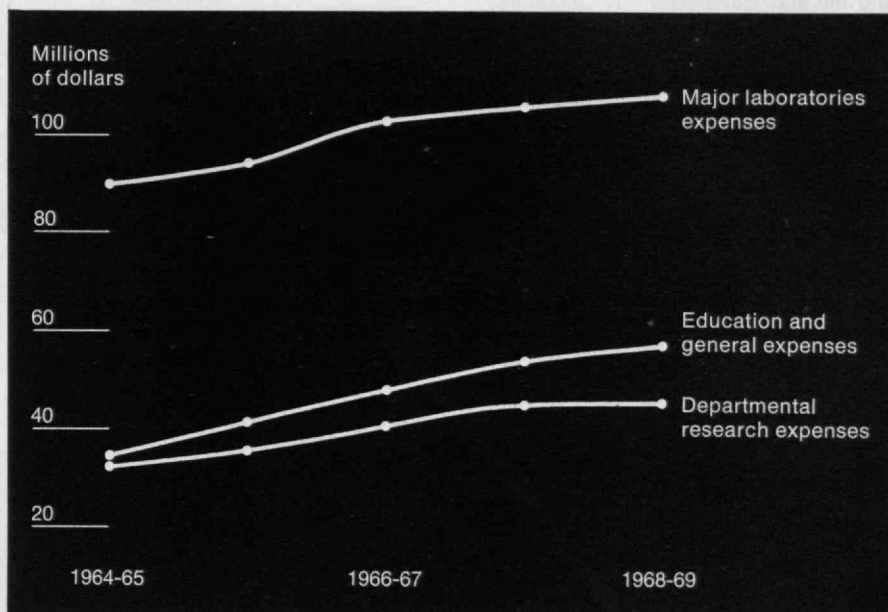
The rate of advance has slowed from 7 per cent in 1967-68 and 12 per cent in 1966-67; considering the factors of inflation selectively attacking expenditures for higher education (see *Technology Review* for October/November, page 102), the 1968-69 "advance" may in fact represent a slight decline in actual operations.

M.I.T.'s educational and general expenses increased 5 per cent to \$57.3 million in 1968-69—the increase representing chiefly adjustments in salaries and wages, according to Mr. Snyder. Departmental and interdepartmental research remained unchanged, and the direct expenses of the major laboratories (including Instrumentation and Lincoln Laboratories) grew to just over \$108 million—an increase of less than 2 per cent.

Total income through gifts, grants, and bequests was \$29,652,000 compared with \$25,881,000 in 1967-68. Indeed, wrote Mr. Snyder in his report, the current figure was "exceeded in only one earlier year when much of the bequest by Alfred P. Sloan, Jr. ('95), was distributed to the Institute."

Total funds of the Institute in 1968-69 were \$290.5 million, compared with \$259.8 million in 1967-68; of these figures endowment funds represented \$142.5 and \$135.2 million, respectively. One major factor in the fund increases in 1968-69 was net realized gain on securities of \$13 million, compared with \$9.2 million in 1967-68.

Funds sharing in the income from M.I.T.'s general investments earned 6.89 per cent in 1968-69, Mr. Snyder reported. Nearly three-quarters of the endowment funds of the Institute are invested in common stocks taken at market values.



A steady growth in both teaching and research expenditures which dates back at M.I.T. to at least 1950, was slowed in 1968-69. The chart, based on figures in the 1969 annual report of M.I.T.'s Treas-

urer, shows a declining growth rate (affecting especially departmental research) which may in fact—because of inflationary factors—represent a modest decline in actual operations.

## CTOП the Foolishness

Harold E. Edgerton, Sc.D. '31, Emeritus Institute Professor at M.I.T., discovered the Russian word for "stop" while standing on the bridge of one of the world's largest oceanographic vessels in mid-Atlantic last summer. He was one of four Americans aboard on the *Akademik Kurachatov* as guest scientists on a six-week cruise from Southampton to Boston by way of Africa; and "stop this foolishness"—meaning Russian-American antagonism—thereafter became the rallying call for all aboard for the rest of the cruise.

"The foolishness" was notably absent at sea, says Professor Edgerton. With him were two M.I.T. students—James W. Sholer, '71, and Michael A. Hobart, '71—and Stephen Eittrheim of Columbia University's Lamont Laboratory. Professor Edgerton's project during the ship's survey of the mid-Atlantic Rift Valley—an

area of special significance for theories of continental drift—was to test a small sonar unit designed to operate on the ocean floor; the device, he says, turned out to be underdesigned, so one of the results of the cruise was to repeat every oceanographer's lesson "to respect the ocean." But Professor Edgerton also participated in the Russians' ongoing sonar research and made many important photographs of the sea bottom.

Mr. Hobart brought with him his own heat probe equipment from the laboratory of Professor Gene Simmons to study heat flow in and near the mid-Atlantic Rift Valley; and he worked closely with Russian scientists making similar studies.

"The foolishness" recurred on land, however, when the *Akademik Kurachatov* arrived in Boston to deliver Professor Edgerton and his colleagues back to M.I.T. A series of telephone calls between Boston and Washington left un-



resolved for several embarrassing hours the question of whether the ship's crew had permission to travel from Boston to Cambridge. Finally all of the ship's scientific staff and many of the crew did come to Cambridge, and more than 100 of them spent a day at the Woods Hole Oceanographic Institution. The hospitality was gracious, however, when the *Kurachatov* held open house for the M.I.T. and W.H.O.I. communities—and later for several thousand Greater Boston residents.

The *Kurachatov* and a sister ship are the two largest—by far—oceanographic vessels in the world. The *Kurachatov*'s equipment is first-rate, says Professor Edgerton, the accommodations superb, and the staff competent. The scientific program during the cruise included, in addition to the heat probe and sonar work, sea floor dredging and coring, magnetism research, seismological studies, and cosmic ray work.

About half a ton of rock was brought up from the mid-Atlantic sea floor, and some of them were given to M.I.T. and W.H.O.I. by Gleb Udintsev of the U.S.S.R. Academy of Sciences' Institute of Oceanology, chief scientist on the cruise. Likewise, copies of seismic, hydraulic, and magnetic profiles were presented to W.H.O.I. Participation of the U.S. scientists was sponsored in part by the National Geographic Society, whose flag was flown from the Akademik *Kurachatov* while the ship was in Boston Harbor.

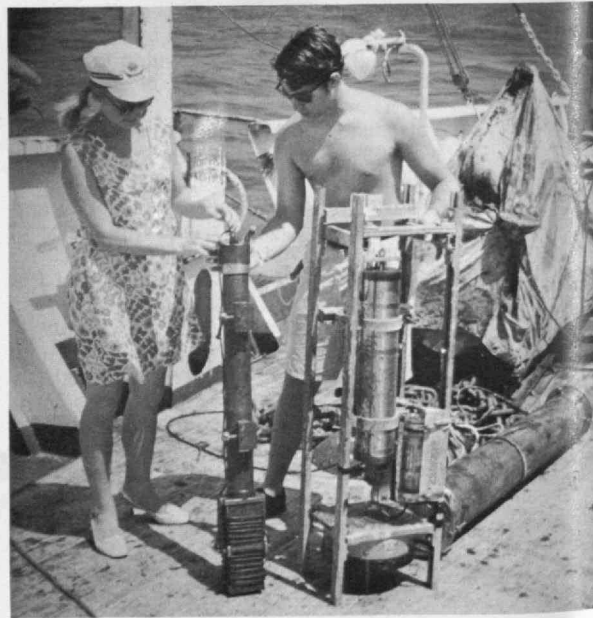
### The Ecology of a University

As M.I.T. becomes larger and more complex, is it moving down a path into which the members of its community are locked because they can find no alternatives?

This reality may not be as certain as it seems, Dr. Benson R. Snyder, M.I.T.'s new Dean for Institute Relations, told members of the Student-Faculty Advisory Committee to the M.I.T. Corporation this fall. His new assignment as Dean for Institute Relations, Dr. Snyder said, is "an ecological study of an educational institution"—an effort to look at all aspects of an institution to "seek points of contact where issues overlap," where groups in the community can come together in new ways for interactions which provide a different view of issues and decisions.

Dr. Snyder's description was a principal part of the agenda for the first meeting of the Corporation's new committee, which is chaired by Gregory Smith, '30. Its role is to overcome what Mr. Smith called "a vast ignorance among students of what the Corporation means and a vast ignorance among members of the Corporation of their potential role in the community." David A. Shepard, '26, a Life Member of the Corporation since 1956, was optimistic: "I know no other place at M.I.T. where I have an opportunity to talk and hear about what other parts of the community think."

"A condition of my going," says Professor Harold E. Edgerton, Sc.D.'31, "was that they bring me home." *Kurachatov*, the great Russian oceanographic vessel, did so, and there was unrestrained joy aboard and ashore in Boston Harbor on September 11. The pictures show Mrs. Edgerton welcoming her husband (right) and Chief Scientist Gleb Udintsev at the gangplank, M.I.T. student James W. Sholer, '71, working with Illa Popova during the cruise, and the ocean bottom 2400 meters beneath *Kurachatov* in the mid-Atlantic.





Committee members announced by James R. Killian, Jr., '26, Chairman of the Corporation, shortly before the Committee's first open sessions are—in addition to Mr. Smith and Mr. Shepard: Michael A. Albert, '70, *ex-officio* as President of the Undergraduate Association; Hayward R. Alker, '59, Professor of Political Science; Theodore H. Bentinnen, a graduate student in the Department of Earth and Planetary Sciences; Vannevar Bush, '16, Honorary Chairman of the Corporation; James A. Champy, '63; Ralph M. Davison, '66, *ex-officio* as President of the Graduate Student Council; Jay W. Forrester, S.M.'45, Professor of Management; Herman A. Haus, Professor of Electrical Engineering; Randolph G. Hawthorne, '70; Donlyn Lyndon, Head of the Department of Architecture; William T. Martin, *ex-officio* as Chairman of the Faculty; Philip H. Peters, '37, President of the M.I.T. Alumni Association; Marvin A. Sirbu, Jr., '66, a graduate student in the Department of Electrical Engineering; Jephtha H. Wade, '35; Karen H. Wattel, '70, Secretary-General of the Undergraduate Association; and Steven Weinberg, Professor of Physics.

### Alumni on Visiting Committees

Thirty-five M.I.T. alumni have been named to new appointments on Corporation visiting committees to departments and other activities at the Institute. Their role will be to meet with and advise the faculty—and to report on their findings and recommendations to members of the M.I.T. Corporation.

Among the new appointees are Edwin E. Aldrin, Jr., Sc.D.'63, the Apollo 11 astronaut, to the Visiting Committee for Earth and Planetary Sciences; George P. Shultz, '49, U.S. Secretary of Labor, to the Committee for the Department of Economics; and Virgilio Barco-Vargas, '43, former Mayor of Bogota, Colombia, who is now Executive Director of the International Bank for Reconstruction and Development, to the Committee for the Department of Political Science.

Other alumni who are new visiting committee appointees and their assignments are:

**Aeronautics and Astronautics**—J. Russell Clark, '29, Senior Vice-President, LTV Aerospace Corp.

**Architecture and Planning**—Rai Y. Okamoto, '51, President and Treasurer, Okamoto/Liskamm.

**Biology**—Leon A. Sweet, '57, Vice-President—Research, Development and Application, Parke, Davis and Co.

**Chemical Engineering**—Maurice F. Granville, '39, Vice-President and Assistant to the Chairman of the Board, Texaco, Inc.

**Civil Engineering**—William H. Mills, '34, President, Mills and Jones Construction Co.

**Earth and Planetary Sciences**—Douglas L. Brooks, Sc.D.'43, President Travelers Research Corp.

**Economics**—Thomas F. Creamer, '40, Senior Vice-President, First National City Bank, New York; and William H. George, '40, Executive Vice-President, Aluminum Company of America.

**Electrical Engineering**—Theodore P. Heuchling,

'46, Vice-President and Head of the Engineering Division, Arthur D. Little, Inc.

**Foreign Literature and Linguistics**—Charles E. Bossi, '42, Former President, Angell Manufacturing Co. and Dayton Etched Products Corp.; and Kemon P. Taschioglou, '49, Publications Manager, Teradyne, Inc.

**Humanities**—Kenneth J. Germeshausen, '31, Chairman of the Board and Director of Research, E G and G, Inc.

**Libraries**—I. Austin Kelly III, '26, President, National Employee Relations Institute, Inc.; and F. Richard Meyer III, '42, business consultant of Chicago, Ill.

**Alfred P. Sloan School of Management**—Paul V. Keyser, Jr., '29, Executive Vice-President and Director, Mobil Oil Corp.

**Mathematics**—Jerome T. Coe, '42, Vice-President and General Manager, Industry Components and Metallurgical Division, General Electric Co.

**Medical Department**—William S. Ederly, '49, Financial Vice-President, Cabot Corp.; Jack C. Page, '48, Vice-President, Booz, Allen and Hamilton, Inc., Dallas; and Dr. Harry Shwachman, '32, Chief, Laboratories of Clinical Pathology and Chief, Clinical Nutrition Division, Children's Hospital Medical Center; and Clinical Professor of Pediatrics, Harvard Medical School.

**Metallurgy and Materials Science**—Donald J. Blickwede, '48, Vice-President and Director of Research, Bethlehem Steel Corp.; Maurice E. Shank, '49, Director, Advanced Materials Research and Development Laboratory, Pratt and Whitney Aircraft, Division of United Aircraft Corp.

**Nuclear Engineering**—Joseph C. Rengel, '60, Executive Vice-President, Nuclear Energy Systems, Westinghouse Electric Corp.; and Francis M. Staszkesy, '42, Executive Vice-President, Boston Edison Co.

**Nutrition and Food Science**—Ray C. Frodey, '44, Vice-President, Research and Quality Control, Gerber Products Co.; Russell L. Haden, Jr., '40, President, Ionics, Inc.; and Harold M. Rich, '51, President, Hal Rich and Associates.

**Physics**—George H. Vineyard, '41, Deputy Director, Brookhaven National Laboratory.

**Political Science**—Robert C. Casselman, '39, Director, Office of Modernization, Commonwealth of Massachusetts.

**Psychology**—Marion W. Boyer, '25, Executive Vice-President and Director, Retired, Standard Oil Co. (New Jersey); and Douglas M. Surgenor, '46, Provost, Faculty of Health Sciences, State University of New York at Buffalo.

**Sponsored Research**—Herbert E. Brier, '33, Senior Vice-President, E G and G, Inc.

**Student Affairs**—John A. Hrones, '34, Provost for Science and Technology, Case Western Reserve University.

### American Political Parties

A broad range of political leaders, activists, office holders, newsmen and scholars will participate in a comprehensive study of American political parties being undertaken for the Twentieth Century Fund by John S. Saloma, III, '56, Associate Professor of Political Science at M.I.T., and Frederick H. Sontag, a research and public relations consultant of Montclair, N.J.

The study's purpose is "to help make political parties more relevant to new requirements of leadership and effective government in the 1970's and to increase public understanding of them," according to Professor Saloma. It will deal with a wide range of issues relating to the struc-



ture, organization, finances and campaign techniques of American political parties.

The result will be "an objective and critical study" covering such questions as: In what ways can and do political party organizations affect the individual citizen and the quality of American life? How open to popular participation can or should political parties be? How has the position of the professional party politician changed with the decline of machine politics and traditional forms of party patronage? What are the prospects for new independent parties? How will mass media affect party conventions? What is the influence of the growth of professional political management consultation? The Twentieth Century Fund is a non-partisan research foundation which undertakes critical and analytical studies of major economic, political and social issues and institutions. Professor Saloma has told the *New York Times* that he believes this is the first time that a private fund had financed such research. The amount of the grant was not announced.

### Alumni and Students: "Person-sized Contributions"

"The essential challenge for the coming decade," President Howard W. Johnson told alumni attending the 1969 Alumni Officers' Conference at M.I.T. this fall, "is to reestablish the concept of humanity," to provide "a sensitive means for making technology deal with man's needs."

Through all the changes which technology has brought to modern living, he said, man still needs privacy, independence, and the ability to make a "person-sized contribution."

Understanding this imperative as it affects M.I.T. and its students occupied the 500 alumni and their wives during the remainder of the two-day meeting, during which more than 50 students attended as invited guests.

#### "Why Things Don't Work"

The focus of change is itself changing, said Gary F. Gut, '70—from technology to humanity. It is easy to see in the U.S. "a country ruled by a cruel and selfish oligarchy dedicated to maintaining its position," he told the alumni, "and the universities have been a party to this."

"Today we ask, what kind of society and university do we have that perpetuates these conditions? And what can we do to change it?"

Mr. Gut's answer, for himself: to make the real world part of learning. "My classroom is dissolving—it is everywhere," he said. "Now I can get credit for what I can experience as well as for what I can read, and academic grades are becoming an inadequate way for me to measure my achievement."

When they go into the communities surrounding M.I.T. to understand urban problems and poverty, said Thomas C.

Woodruff, '70, students find massive in-grown systems of authorities and organizations that fear change." They want an education which will help them change these conditions. "We want to understand why things aren't working," he said.

One of M.I.T.'s responses is to provide an increasing diversity in the educational experience, said Paul E. Gray, '54, Associate Provost—to balance emphasis throughout the undergraduate program between the transfer of information and the development of attitudes, to eliminate "prescriptive" programs in favor of plans for students to direct themselves.

But while M.I.T. seeks "multiple kinds of intellectual encounter," our teaching still has a singular form—the lecture-recitation. "Is any single style of learning adequate for the range of needs and experiences of today's M.I.T. students?" Professor Gray asked.

#### "Grades Aren't What You Want to Know!"

Later, the afternoon panel discussions permitted to productive give-and-take on these issues between individual students, faculty, and alumni. Examples from the resulting dialogue:

**Alumnus:** the key word at M.I.T. should be "excellence." M.I.T.'s interest in community affairs is good—but inadequate. Only if the university can do more—and do it well—can I foresee success.

**Student:** It is simply by chance that the profit of industry or the pleasure of a bureaucrat is synonymous with the real needs of man. We need to make social research economically viable.

**Student:** My community activities "raise whole new dimensions of questions." Students teaching in the Cambridge schools and tutoring in Boston neighborhoods are "the student component of the school of education that M.I.T. doesn't have."

**Alumnus:** If you were in the M.I.T. Admissions Office and if you had just pass-fail records from high schools to work with, could you select a new M.I.T. class?

**Student:** Grades aren't what you want to know about me. I don't care if I get an A or a D. Students want to get the kind of education they want, not to be compared.

**The alumnus:** But you will be compared against others the rest of your life. A student's performance is the sum of various people's judgements; why not compare one with another?

**The student:** Being compared is not what I came for. I came for an education.

**Alumnus:** All of this debate is sort of sweeping under the rug the fact that if M.I.T. doesn't do the research the Russians will be glad to do it—here, in 20 years.

Howard W. Johnson's phrase—"person-sized" contribution—might have been the keynote of the 1969 Alumni Officers' Conference in Cambridge this fall. The active discussion between students, staff, and alumni ranged widely over themes as diverse as student radicalism, classrooms and laboratories, pass/fail grading, high school teaching, underprivileged blacks, and national defense. If no one found unanimity, a good many may have found understanding. (Photos: Owen D. Franken, '69)







Another alumnus: But this is the crux of the problem. To assume that the same rules apply today as in 1945 is foolish. Our priorities have changed—because the Russians have changed and because we see other needs as more acute. No one has put so much energy into urgent social needs as to reaching the moon, and we must make a beginning.

### National Awards

The Bronze Beaver Award, highest honor of the M.I.T. Alumni Association, was given to nine M.I.T. graduates and Presidential Citations were awarded to two M.I.T. clubs on September 5 at the Awards Luncheon of the 1969 Alumni Officers' Conference by Philip H. Peters, '37, President of the Association.

#### The Bronze Beaver winners:

◆ Dayton H. Clewell, '33, who has served as Class and Club Officer, Honorary Secretary, Educational Counsellor, Alumni Fund worker, and member of the M.I.T. Corporation and its Visiting Committees, for "untiring participation and considerate, imaginative guidance."

◆ Andrew D. Fuller, '95, 60 years ago a charter member of the Alumni Council and a member of the Association for 75 years, "an inspiration for devoted and effective service to his fellow-alumni."

◆ Cecil H. Green, '23, who was President of the Alumni Association in 1968-69 and has "for decades provided the leadership for M.I.T. in the southwest," for "his dedicated service to the Institute, commitment to his community, and luminous personality."

◆ Ellis C. Littmann, '33, whose service to the Alumni Association was climaxed when he was Chairman of the 1969 Midwest Regional Conference, for "cheerful and unflagging contribution to the welfare of the Institute."

◆ Azel W. Mack, '15, who "in his capacity as Secretary of his Class for over 40 years has become so much the personification of alumni and class service that he is indeed 'Mr. M.I.T. Class of 1915.'"

◆ Thornton W. Owen, '26, whose "record of leadership and commitment (as Class Agent, member of the Corporation Development Committee, Class Estate Secretary, and Chairman of the Washington Area Council of the Alumni Fund) is an inspiring example to all alumni."

◆ Howard L. Richardson, '31, Chairman of the Alumni Fund Board from 1967 to 1969 and a principal participant in the Long-Range Planning Committee, whose "spectrum of activities and wisdom of counsel are eloquent demonstrations of the varied ways alumni contribute to the enhancement of the Institute."

◆ Raymond A. St. Laurent, '21, who has been Class Secretary, Class President, Honorary Secretary, worker for the

Alumni Fund, and member of the Alumni Advisory Council and of the Association's Executive Committee, and who "has helped the Institute and his class to achieve a proud history in the annals of M.I.T."

◆ Kenneth R. Wadleigh, '43, Vice President and formerly Dean of Student Affairs at M.I.T., for his "leadership in developing understanding during a period of fundamental campus changes (which) is an inspiration to students, faculty and alumni."

The Presidential Citations were presented to the M.I.T. Alumni Center of New York and the M.I.T. Club of Mexico.

### Kennedy Scholars

The Trustees of the Kennedy Memorial Fund have named 11 students at British colleges as Kennedy Scholars for the academic year 1969-70. Four will attend M.I.T. and seven Harvard University as graduate students. The fellowship was established four years ago by public subscription as a memorial to John F. Kennedy.

Coming to M.I.T. are Roger Evans, of Selwyn College, Cambridge, in mechanical engineering, Roger Foot of Birmingham University, in civil engineering, Keith Glover of Imperial College, London, in electrical engineering, and Ronald P. Smith of Christ's College, Cambridge, in economics.

### Warren S. McCulloch, 1898-1969

Dr. Warren S. McCulloch, internationally known neurophysiologist who had been a member of the M.I.T. Research Laboratory of Electronics since 1952, died in Old Lyme, Conn., on September 24. He was 70 years old.

*Time* Magazine called Dr. McCulloch a "multifaceted scientist who embraced the disciplines of philosophy, psychiatry, and physiology." He was credited with major contributions through research on the principles of control, feedback and communications manifested in neural networks; and he was the author, with the late Walter H. Pitts, of theories relating the functions of the brain to those of computational machines—electrical networks which manipulate information in logical ways.

Dr. McCulloch studied at Yale (A.B. 1921) and Columbia (M.A. 1923, M.D. 1927) Universities, and he served as intern and resident in neurology at Bellevue Hospital. He had taught at the Yale and University of Illinois Medical Schools before coming to M.I.T. 17 years ago. Since then he had become known for informal contacts with students and for research contributions to brain circuitry and networks. Dr. McCulloch was a colleague of the late Norbert Wiener, M.I.T. Institute Professor, in the development of cybernetics, and he was the first President of the American Society for Cybernetics two years ago.



Horace S. Ford

### Horace S. Ford, 1885-1969

Horace S. Ford, 84, Treasurer Emeritus of M.I.T., died on September 23 after a long illness. He had been associated with the Institute for 55 years and had been a Life Member of the Corporation since 1934.

In his tribute at memorial services on September 26, James R. Killian, Jr., '26, Chairman of the Corporation, said Mr. Ford "not only administered the Institute's business and then its investment affairs with great skill and foresight, but he became an adviser extraordinary to the Institute community. Over the years he became affectionately known . . . by students, faculty and employees as 'Uncle Horace,' " Dr. Killian said, "and he cherished and cultivated this role."

Mr. Ford, who was born and educated in Gloucester, Mass., forsook a promising career in banking (he was Assistant Cashier of Old Colony Trust Co.) to come to M.I.T. in 1914 to be in charge of the Institute's business administration as Bursar. He became Treasurer of the Institute in 1934, a post which he held until his retirement in 1950; later he served as Special Adviser to the President, and he was Chairman of the Corporation's Finance Committee until 1962. During this period Mr. Ford was also associated as director, trustee, or adviser with many New England corporations, universities, municipalities, and financial and philanthropic institutions. He had a central role in organizing M.I.T. facilities for large-scale research undertakings during World War II, and in 1948 President Harry S. Truman cited him for the Medal of Merit "for his foresight and financial genius providing for the unprecedented expansion of M.I.T. facilities."

In the course of Mr. Ford's 34 years as a university business officer, Dr. Killian wrote the M.I.T. community in reporting his death, "Mr. Ford became a national

# "Crystalline Clarity, Engaging Brusqueness"

*The following are excerpts from the eulogy to the late Horace S. Ford, Treasurer Emeritus of M.I.T., delivered by James R. Killian, Jr., '26, Chairman of the Corporation, at services in the Baptist Church in Brookline on September 26:*

"Horace Ford had an exceptional capacity to adjust the work of the counting room to the best needs of the classroom, with the classroom always being of paramount concern.

"In the councils of the M.I.T. Corporation and in other places he became noted for his Treasurer's Reports. He could invest a financial statement with wit and crystalline clarity, and his verbal reports were looked forward to and relished. He could also joke about his printed reports, and he often told the story of the late economist, Professor Davis R. Dewey, coming into his office to ask a question about a newly issued annual Treasurer's Report. 'Have you any comments about the report?' asked Horace. 'Yes,' said Professor Dewey with a twinkle in his eye, 'it makes light summer reading and ranks with the best fiction of the day.'

"In his discourse and his work with his associates and friends, he had a manner that was marked by crispness of speech, an engaging brusqueness, by lightness of touch and decisiveness of manner that led people to respond with candor, confidence, and satisfaction. He had a directness that brought out the best in people and frequently left them with the feeling that they had powers they had not hitherto assigned to themselves. I recall a young freshman, the son of an M.I.T. alumnus and a friend of Horace's, who went in to see Horace and to express doubt about his capacity to pass his courses. Horace turned to him and said, 'Son, your old man made it, didn't he?' 'Yes,' said the student. 'Then,' said Horace, 'Why should you worry?' And the son made it.

"In the days of his prime he was a man of great vigor and zest in his extra-curricular activities. He was an ardent swimmer and loved the sea but also the mountains, and I remember during wartime days how a group of us occasionally journeyed by train and bus to Joe Dodge's establishment at Pinkham Notch in the White Mountains from there to climb Washington and adjacent mountains, as Horace once said, 'in a middle-aged manner.' In such activities he was a wonderfully companionable man, and some of my own most memorable recollections are of those occasions when we sat together on some mountainside, stripped down to the waist in the warm Indian summer sun, while his companions found invigoration not only in the mountain heights but in the heights of Horace's zestful quips and joy in life.

"This was Horace Ford as I remember him. I have many reasons, expressed and unexpressed, for recalling the man and the administrator with gratitude and emotion, and I also know that I speak for all the great throng who loved and admired him in expressing what we feel and in rejoicing in all that he was and did. As we recall him on the mountain trails of his career, we can pause in reverence for his life and in our sense of loss feel more deeply today what Wordsworth felt when he wrote of

'The silence that is in the starry sky

'The sleep that is among the lonely hills.' "





Gordon S. Brown, '31 (far right, hands in mid-air), Jackson Professor of Electrical Engineering, was one of the first experts called by the new Commission on the Nature and Purposes of an M.I.T. Educa-

tion this fall. Kenneth M. Hoffman (right), Professor of Mathematics who is Chairman of the Commission, and Joel Orlen, its staff director, are at the head of the table.

leader in formulating and advocating sound policies and procedures for university administration. He played a key role in maintaining M.I.T.'s strength through difficult years which included two world wars and two major depressions," Dr. Killian said. "During his tenure, the endowment of the Institute nearly doubled."

### Electrical Engineering Awards

Seven graduate students and one Assistant Professor in the Department of Electrical Engineering have received awards for excellence in teaching.

John J. Donovan, Assistant Professor of Electrical Engineering, holds the first annual David T. Shultz Award of \$1,000. Louis D. Smullin, S.M.'39, Head of the Department of Electrical Engineering, cited Professor Donovan for "inspiring and effective teaching of Digital Computer Programming Systems, a subject taken each year by about 550 students from all M.I.T. departments; and for the organization of an exciting project subject, Operating Systems.

Five awards of \$500 each for excellence in teaching were presented to graduate students on behalf of Supervised Investors Services, Inc.; and two were given in honor of the late Carlton E. Tucker ('18). Recipients were Louis B. D. Braida, S.M.'65; Frederick A. Centanni, Jr., '66; John R. Coffman, '66; Paul Demko, Jr., '66; Alan B. Hayes, '67; Stuart E. Madnick, '66, and Rolf Nevald.

### "A Doing Commission, and a Thinking One"

Kenneth M. Hoffman, Professor of Mathematics who has taught at M.I.T. since completing his graduate studies in 1956, is President Howard W. Johnson's

choice to head the new Commission on the Nature and Purposes of M.I.T. Education (see Technology Review for October/November, page 100).

Six faculty members and students will work with him on the task of defining the role of the Institute and how it may be fulfilled in the next decade: Samuel W. Bodman, III, Sc.D.'65, Associate Professor of Chemical Engineering; Daniel S. Kemp, Associate Professor of Chemistry; O. William Lever, graduate student in the Department of Chemistry; Charles E. Mann, '72 undergraduate in chemistry; Erik L. Mollo-Christensen, '48, Professor of Meteorology; Marvin A. Sirbu, '66, graduate student in the Department of Electrical Engineering; Louis D. Smullin, S.M.'39, Head of the Department of Electrical Engineering; Arthur R. Steinberg, Assistant Professor of Humanities; Laurence Storch, '71, undergraduate in Civil Engineering; Lester C. Thurow, Associate Professor of Economics and of Management; and Shiela E. Widnall, '60, Assistant Professor of Aeronautics and Astronautics.

Joel Orlen, Administrative Officer in the M.I.T. School of Science, will be the Commission's staff director, Mr. Johnson said.

The Commission's new Chairman told a press conference following President Johnson's announcement that the group's work "will not be minor perturbations on an old theme." Indeed, though he has no educated view of specific recommendations which may emerge from the Commission deliberations, Professor Hoffman reported his judgment that "we need to introduce a new component into engineering and scientific education, to broaden engineering and science graduates as people, to achieve a larger view of what

really constitutes a well trained engineer." The result, he said, should be "a new and bolder idea about what kind of people should come from M.I.T."

In reaching this goal, Professor Hoffman emphasized, the Commission will be as much concerned with how to accomplish its purposes as with defining them. In this sense, he said, the Commission will be "a 'doing' organization as well as a 'thinking' one."

In this announcement, President Johnson said the Commission membership "combines intellectual distinction and the perspective of youth. This is appropriate," he added, "because I believe that the future of the Institute lies with the responsible young members of our community."

President Johnson said he would appoint several consulting members of the Commission to work closely with it on specific topics and that other members of the faculty would be asked to prepare papers on issues before the group. The Commission itself will conduct its business in open meetings, said Professor Hoffman, and it will solicit written and verbal communications. He hopes it can offer "a unique opportunity to people who are interested in change at M.I.T. to devote time and effort to achieving their purposes."

Professor Hoffman's experience at M.I.T. includes teaching mathematics at both undergraduate and graduate levels; he is the author of textbooks used by both. Professor Hoffman has had consulting experience in applied mathematics and for the past year—until his appointment as Chairman of the Commission—has been in charge of the work in pure mathematics within the M.I.T. Department.



*The week-long orientation and rushing programs behind them, members of the M.I.T. Class of 1973 found a "home away from home" at 111 Memorial Drive on Sunday, September 21, when President and Mrs. Howard W. Johnson entertained at the annual reception for new students and their parents.*



## Robert H. Winters, 1910-1969

One of Canada's distinguished political leaders, the Honorable Robert H. Winters, S.M.'33, who was a Life Member of the M.I.T. Corporation, died suddenly of a coronary thrombosis in Monterey, Calif., on October 10. He was 59.

Mr. Winters' connection with Liberal governments in Canada began in 1945, when he was elected to the House of Commons for Queens-Lunenburg. Three years later he became Parliamentary Assistant to the Minister of Transport, and later in 1948 he was named Minister of Reconstruction and Supply. He also served as Minister of Resources and Development, 1950 to 1953, and Minister of Public Works, 1950 to 1957. He re-entered politics in 1965 by winning a seat representing Toronto in the Federal Parliament, and he ran unsuccessfully against Pierre E. Trudeau last year to succeed Lester B. Pearson as Liberal Party leader.

Mr. Winters studied at Mount Allison University, Sackville, New Brunswick, (A.B. 1931) and at M.I.T. for the S.M. in electrical engineering. His professional work before entering the government was with the Northern Electric Co., Ltd., of Montreal. In 1957 he became President of the Rio Tinto Mining Co. and for the next eight years he played a leading role in hydroelectric power developments in Ontario and Newfoundland. Mr. Winters was a director of many industrial and financial corporations and a trustee of many educational and cultural institutions; at the time of his death, Mr. Winters was serving as President of Brascan, Ltd. (Brazilian Light and Power Co., Ltd.).

Mr. Winters' service to M.I.T. began in 1952 with membership on various Visiting Committees of the Corporation. He was an Alumni Term Member of the Corporation from 1960 to 1965 and President of the Alumni Association in 1963-64, and he became a Life Member of the Corporation in 1965.



## Welcome to 1973

When the roll cards were sorted and the computers turned to other tasks, M.I.T. was able to confirm that the Class of 1973, new on the campus this fall, numbers 964 freshmen. They were selected as most likely to succeed from more than 4,000 final applicants.

The credentials are impressive. Ninety per cent were in the top tenth of their high school classes and scored above 700 on the College Entrance Examination Board's mathematics aptitude test; 26 came to M.I.T. after completing requirements in only three years of secondary school work. One-third of the new class members have won major awards in science fairs or National Science Foundation summer programs, more than one-third hold letters for varsity sports participation, and nearly half have held major positions in high school music, debate or dramatics.

The freshmen come from 46 of the 50 states—but more than half of them are from New England and the Middle Atlantic region. They represent 766 secondary schools, but nearly 90 per cent came from U.S. public high schools. Among them are 57 foreign students from such places as Canada (14), Sierra Leone, Iceland, and Malaysia.

The class includes 72 girls, and M.I.T.'s corridors are also graced this fall by 11 young women transferring to the Institute from other colleges—including six from Wellesley.

### Above the Average

M.I.T.'s Class of 1973 is unique in one most important way: it includes 52 black students, just half of the total number of blacks registered at the Institute this fall. The increase results from extensive efforts during the past year to attract to M.I.T. black students (and disadvantaged non-blacks) with an interest in science-



based education and, in some cases, potential not fully reflected in their scholastic records.

Many of the black students and some others who seemed to need special preparation for the intensity of M.I.T.'s freshman year were invited to M.I.T. in mid-summer for an eight-week academic program. They studied physics, calculus, and humanities and were offered additional electives in developmental reading and the elements of computers. Special help is being continued for these students—and for others who may need it—during the fall.

Have M.I.T.'s special efforts to identify and bring to Cambridge promising disadvantaged students been successful in the Class of 1973? No one will hazard a judgment for at least another year or two, but Paul E. Gray, '54, Associate Provost who has major responsibility for first-year studies at the Institute, says those involved in teaching the summer program found that group of students "as a whole above the average of M.I.T. freshmen" in terms of emotional maturity and not significantly behind in terms of general readiness for college.

### **The Moon Show: A Celebration or Science Commercialized?**

When art and science interface, the point is usually to use scientific phenomena or engineering techniques to yield new visual (or aural, or multimedia) effects. Not quite so at M.I.T. this fall.

In "The Moon Show," which filled the Hayden Gallery and its environs in September and October, the emphasis was somewhat different. For this was planned as a multimedia celebration of the technological achievement of Apollo 11, a combination of sight and sound to create an environment in which to better conceive the remarkable human achievement of reaching the moon.

In an entirely black room, the spotlights focused on an incongruously minute vial of dust from the lunar surface—part of the sample assigned to M.I.T. for chemical and geological research. Surrounding it, as a background, were examples of the sophisticated hardware associated with the Apollo lunar landing, photographs of the moon and motion pictures of various N.A.S.A. missions projected onto hanging screens, and expressions from fiction and other sources of how conquering the moon has been one of mankind's recurring dreams.

Wayne V. Anderson, Chairman of M.I.T.'s Committee on the Visual Arts, said the show was intended "as a poetic approach to the human significance of the moon landing." He hoped it would provoke "a mood of thoughtful challenge," he said—a chance for visitors to share the true achievement of Apollo, to weigh the purposes of the U.S. space program and of American technology, and to understand M.I.T.'s contributions to "man's most dramatized accomplishment."

Its unusual objective—and the chance to see "for real" the moon dust itself—kept "The Moon Show" crowded throughout its two-month run. William A. Davis of the *Boston Globe*, who attended the preview, said "it added up to something like a lunar psychedelic sound and light show." Fred S. Kardon of the *Worcester Telegram* described a young visitor who stationed himself under the central spotlight with his gaze fixed on the tiny vial, saying to any who would listen, "That's the moon, man . . . and I'm sittin' here lookin' at it."

Less poetic, the *Catalyst* (M.I.T. graduate student newspaper) wondered "how unfortunate it is that the efforts of many hard-working engineers must be reflected in a flickering technicolor light show in the form of the ultimate commercialization of science."

The vial of moon dust which the exhibition was planned to celebrate (center, right) was no match for the projected images of the moon and man's efforts to understand it—or for the conversation of opening-night visitors—at "The Moon Show" in the Hayden Gallery of M.I.T. this fall.

### **Daniel G. Webster, 1912-1969**

Over 40 years of service to M.I.T. came to a premature close with the unexpected death on September 20 of Daniel G. Webster, Manager of Campus Housing; he was 56.

Mr. Webster first came to M.I.T. in 1927 as a blueprint operator in what is now the Graphic Arts Service, and he later advanced into photographic and then administrative work. After four years in industry he returned in 1954 to be Associate Director of the Graphic Arts Service and later to assume his housing assignment.

Mr. Webster was a past Master of the Richard C. MacLaurin Lodge of Masons and a past President of the M.I.T. Credit Union. He was Secretary and a national Director of the Society of Reproduction Engineers.

### **Priscilla Ann Karb, 1943-1969**

Priscilla Ann Karb, '43, Associate Director of Executive Development Programs in the M.I.T. Sloan School of Management, died on October 8 following a short illness.

Miss Karb joined M.I.T.'s Executive Development Programs office in 1963, and she has since then become well known and liked by members of both the Sloan Fellowship and Senior Executive Programs. A 1948 graduate of Cornell University, Miss Karb previously had served on the faculties of Laval University, Quebec City, and Bennington College, Vermont, and in an administrative appointment at the Harvard University Graduate School of Business Administration. Recently, Miss Karb had been a consultant to Vassar College, and in June of this year she received the M.Ed. degree from Northeastern University.

Miss Karb is survived by her parents, Mr. and Mrs. E. Russell Karb, and by two brothers, Richard Karb of Framingham, Mass., and Alan Karb of Cherry Hill, Mass.



For many who attended the first-ever seminar for young alumni at M.I.T. in the fall, informal conversations upstaged the formal sessions. The pictures below show Kenneth H. Olson, '50 (left) and Jephtha H. Wade, '45 (right, foreground); it was Mr. Wade who told the seminar members to "emphasize the value of money. Profit-sharing is fine when you have profits; but the real goal," he said, "is to get employees to have money at stake by having it invested in the company." And Mr. Olson: "If you overpay a man you do him a great disservice; if you underpay him he always can go elsewhere."



## How To Start a Company and Make Money With It

Don't go into business for yourself, in a new company, if . . .

. . . if you can't look your favorite invention in the eye six months later and say honestly that it won't make money after all.

. . . if you're not willing to invest everything, even including a second mortgage on your house, in the gamble.

. . . if your wife doesn't share your enthusiasm for 16-hour days and uncertain paychecks.

But if all these—and other—things are true, starting a new business with your background—as an M.I.T. alumnus—is only a "moderate" risk, according to Edward B. Roberts, '57, Associate Professor of Management at M.I.T.



These and a good many other practical observations on how to start and operate a new business were brought to 300 young M.I.T. alumni during a two-day seminar in Cambridge on October 4 and 5. It was a sell-out crowd for one of the most successful experiments in recent M.I.T. alumni activities.

The typical entrepreneur starting a new business is young—and getting younger, said Professor Roberts.

Reporting on a survey of businesses spawned to exploit new technological developments in the Greater Boston area, Professor Roberts said the typical successful entrepreneur has a master's degree, comes from a home where the father was self-employed, and has made his career in development rather than research. He usually has one to ten associates when he sets up shop. His prospects of success are good if he has a technological background and if his business is devoted to "hardware," which gives him the best leverage on his special qualifications.

### Money and How to Find It

The first need of a young man going into business for himself is money, and on this score those attending the M.I.T.

seminar received some simple advice from Adolf F. Monosson, '48, President of the Boston Computer Group, Inc.: "Get your money without giving up equity. Keep your company to yourself as long as you can." And when the time comes, drive a hard bargain with your financiers: "Everyone wants a piece of your action," said George M. Berman, '45, President of the Unitrode Corp.

The test is not how much of your company you can finance yourself; the test is how heavy is your commitment—if you've taken that second mortgage, have your car on payments, and have taken your savings out of the bank.

Jephtha H. Wade, '45, Partner in Choate, Hall and Stewart, added some suggestions on financing and the value of money. Invest fully in your company, he agreed, "but cover yourself with insurance. And make sure, too," he said, "that you have a 'fail-safe' device in the system. Make sure you know how you're going to get out if necessary."

### Marketing and Production

After finance comes the most difficult problem of all: developing and marketing the company's first product. A series of

pitfalls were listed by Amar G. Bose, '51, of the M.I.T. Department of Electrical Engineering, who is Chairman of the Board of Bose Corporation:

◇ The central problem is to keep the engineers and the sales staff working together on the same product. Too often, said Professor Bose, the salesmen are selling something the engineers aren't building, and vice versa.

◇ "With 20-20 hindsight it is easy to see that many people are well down the road before they find out that what they want to do cannot be done," said Professor Bose. In other words, test the product for its feasibility—and if it passes, test it again.

◇ The product may be feasible, but can it be sold? Only a "hard-nosed analysis of features, price, and competition" can yield that answer. There is a real danger, said Professor Bose, that the engineers who develop a new product are so enamoured of its features that they cannot see its weaknesses; put them on the road to sell it. "Take drastic steps to be objective," he said. "Make every decision a closed-loop one."

Keep your eye on the goal of the organization. "The salesmen want the lowest



price, the engineers want to use the latest technology, the president wants a handsome building, the chairman really wants to live in Maine—are these the goals of the company?" asked Kenneth H. Olsen, '50, President of Digital Equipment Corp. "No," replied Charles F. Langenhagen, S.M. '58, a co-owner of Allaco Products: "The function of the firm is to make a profit. All else is a means to this end."

### Questions and Few Answers

As your company grows, expect it to change. It's "very unlikely" that the man who starts a company is the man to run it 10 years later, said Mr. Olsen, whose Digital Equipment Corp. sales have grown from \$15 million in 1965 to \$88 million in 1969.

"The man who can run a 10-man company is not the man to run a 1,000-man organization," he said. But mostly a company president confronts questions with few answers because "a company is made up of goals and values."

If the answers to some of your questions come out wrong, said Dr. Bose, you can still worry too much: you may succeed, despite some wrong answers. And when you do, take comfort from knowing that if you'd had the right answers in the beginning you would never be where you are now.

Indeed, despite all the hazards you hear recounted, don't give up, said several seminar speakers. When you organize a new company, said Mr. Monosson, "don't forget that other people want you as much as you want them. Salesmen are always looking for small companies who will get bigger," he said. "Your customers want something from you. Banks are always on the lookout for potentially profitable accounts." And every investor wants you to succeed, noted Mr. Berman.

### A Continuing Experiment in Faculty Meeting Participation

Students and other non-faculty will be admitted as visitors and certain students who have participated in issues on the agenda will be given speaking privileges at M.I.T. faculty meetings in 1969-70. Only when special business requires a confidential executive session will this year's meetings be closed to the community.

In adopting this plan at its first meeting of the year, the M.I.T. faculty accepted recommendations of its committee evaluating the participation of non-faculty on an experimental basis last spring, which resulted in some of the largest and most controversial faculty meetings in M.I.T. history. Both students and faculty seemed to approve of last spring's arrangements, said the committee. Indeed, many members of the student body "have reacted favorably towards their new opportunities to play a significant and responsible role in the affairs of the Institute," said the committee report.

In addition to non-faculty attendance, the committee recommended that agendas for faculty meetings be published in advance, that faculty committees promptly issue to the entire community reports summarizing the issues which they are studying, that students and non-faculty members of the teaching and research staffs be included on faculty committees "where it seems most feasible and desirable to do so," and that the membership of faculty committees be publicized widely at the beginning of each year.

The committee admitted in its report that larger faculty meetings would probably continue to be longer meetings—and that only a few people would be able to speak. Hence its plea for "widespread serious discussion of basic issues outside the normal faculty meetings."

### Individuals Noteworthy

John Simon Guggenheim Memorial Fellowships to five members of the M.I.T. faculty: *Stanford Anderson*, Assistant Professor of the History of Architecture, *James L. Kinsey*, Associate Professor of Chemistry, *Phillips W. Robbins*, Professor of Biochemistry, *Henry M. Stommel*, Professor of Oceanography, and *Alar Toomre*, Associate Professor of Applied Mathematics.

To *David R. Israel*, '49, Deputy Director of the Defense Communications Planning Group, the Meritorious Civilian Service Medal of the Secretary of Defense . . . To *Albert C. Zettlemoyer*, Ph.D. '41, of Lehigh University, a 1969 Printing Ink Pioneer Award of the National Association of Printing Ink Manufacturers.

*Erskine N. White, Jr.*, S.M. '49, to Vice-President for Operations, Textron, Inc. . . . *Walter J. Robbie*, '42, to President of Gorham Division, Textron, Inc. . . . *Brockway McMillan*, '36, to Vice President of Bell Telephone Laboratories, Inc. . . . The Modern Medicine Distinguished Achievement Award to Dr. *William Had-don, Jr.*, '49, former Director of the National Highway Safety Bureau . . . *W. Buell Evans*, '44, to Professor of Mathematics, Emory University . . . *Robert S. Gillette*, '36, President of Rock of Ages Corp., named Chairman of the Board of National Insurance Co. of Vermont.

*John H. Richardson*, S.M. '59, to Senior Vice-President, Hughes Aircraft Co. . . . *Martin Wohl*, '53, to Program Manager of Transportation Studies at the Urban Institute . . . *Don P. Schlegel*, M. Arch. '52, to Chairman of the Department of Architecture, University of New Mexico . . . *Peter S. Hopkins*, '44, to Vice President (real estate management) of Time, Inc. . . . *Charles R. Houska*, '51, to Head of the Department of Metals and Ceramic Engineering at Virginia Polytechnic Institute.

*Mrs. Marion Hart*, '13, completed 4500 hours of flying time while making a solo flight across the Atlantic, via Iceland, this July; "I'm in search of the sun



Erskine N. White



David R. Israel

for a holiday," she told newsman in Prestwick, Scotland. "It was much too cold in Iceland." . . .

*Vaughn L. Beals*, '48, to Executive Vice President and Director of Cummins Engine Company . . . *Morrison H. Beach*, '42, Senior Vice-President of The Travelers Cos., to Director of the Massachusetts Co., a Travelers subsidiary.

*Karl Pfister*, 3d, '40, to Senior Vice President—Development of Merck, Sharp & Dohme Research Laboratories . . . *James M. Lydon*, '50, to Vice President—Public Relations of Boston Edison Company . . . *Charles A. Myers*, Professor of Industrial Relations at M.I.T., to Chairman of the National Manpower Policy Task Force.

*Hans M. Mark*, Ph.D. '54, to Director of N.A.S.A.'s Ames Research Center . . . Very Rev. *Donald Paul Merrifield*, S.J., Ph.D. '62, to President of Loyola University of Los Angeles, effective June 15, 1969.

When *George P. Schultz*, Ph.D. '49, joined President Nixon's Cabinet as Secretary of Labor, he asked two former colleagues to join him—*Arnold R. Weber*, Ph.D. '58, of the Department of Industrial Relations at the University of Chicago as Assistant Secretary of Labor for Manpower and *David P. Taylor*, Associate Professor of Industrial Relations in the M.I.T. Sloan School of Management, as Executive Assistant to the Secretary.

*Kenneth N. Davis, Jr.*, '46, Vice President and Treasurer of International Business Machines Corporation of New York, nominated as Assistant Secretary of Commerce for Domestic and International Business . . . *Thornton A. Wilson*, '53, to Director of the Seattle First National Bank.

*Breene M. Kerr*, '51, member of the M.I.T. Corporation Development Committee and Visiting Committee for Earth Sciences, became senior partner of a new consulting firm, Resource Analysis and Management Group, Oklahoma City . . . *Dr. John B. Stanbury*, Professor of Experimental Medicine and Director of the M.I.T. Clinical Research Center, elected President of the American Thyroid Association.

**Robert W. Baschnagel**, '32, to Vice-President—Sales of Rochester Gas and Electric Corp. . . . **John M. Hunt**, S.M.'49, to Senior Vice-President and Technical Director of the Friden Division of the Singer Co. . . . **Ward C. McCallister**, San.E.'56, to President of Peoples Gas Light and Coke Co., Chicago . . . **Everard M. Lester**, '28, to Vice-President of Foster Wheeler Corp. . . .

**Edward O. Vetter**, '42, to President of Geophysical Service Incorporated, subsidiary of Texas Instruments Incorporated. **William Murphy, Jr.**, '50, to Director of Buildings and Grounds, Harvard University . . . **Richard S. Gordon**, Ph.D. '54, and **Howard L. Minckler**, S.E.'62, to Vice Presidents of the Monsanto Company. . . . **Charles C. Gates, Jr.**, '43, President of Gates Rubber Company, to Chairman of Lear Jet Industries, Inc.

## Alumni Calendar

**Baltimore-Washington, D.C.**—December 4, Thursday, 6:00 p.m.—Joint dinner meeting, Meeting Hall, Columbia, Md. Speaker: Senator Joseph D. Tydings. Topic: The Chesapeake Bay Estuary Bill.

**Boston**—December 11, Thursday, 12:15 p.m.—Luncheon, Union Oyster House, Union St. Speaker: James Wilson, Sr. Vice President, National Shawmut Bank. Topic: The Economic Outlook in 1970.

**Cambridge**—December 3, Wednesday, 6:30 p.m.—Dinner meeting, the Association of M.I.T. Alumnae, Faculty Club. Speaker: C. Stark Draper, '26, Director, M.I.T. Instrumentation Laboratory.

**Chicago**—December 9, Tuesday, 6:00 p.m.—Dinner meeting, Stouffer's Oakbrook Inn. Speaker: Benson R. Snyder, Dean for Institute Relations, M.I.T.

**Fairfield**—December 3, Wednesday, 6:30 p.m.—Dinner meeting, Chimney Corners Restaurant, Stamford. Speaker: Milledge Mosby, Vice-President-Sales, Mind, Inc. Topic: Computer Learning.

### New York

December 4, Thursday, 9:15 a.m. to 4:00 p.m. All-day tour of the United Nations with luncheon in the U.N. Delegates Dining Room. Theme: Political, Economic and Technological Studies and Projects Conducted by the U.N. in Underdeveloped countries.

December 9, Thursday, 9:00 a.m. to 5:00 p.m.—Seminar, Ford Foundation. Topic: Today's Youth—Tomorrow's Executives. Luncheon at Tudor Hotel at 12 Noon.

December 16, Tuesday, 12:15 p.m.—Luncheon meeting, Nichols Room, Chemists' Club. Speaker: Representative of Humble Oil and Refining Co. Topic: The Story of the S. S. *Manhattan* oil tanker.

**Providence**—December 2, Tuesday, 6:30 p.m.—Dinner meeting, Holiday Inn. Speaker: David G. Wilson, Professor of Mechanical Engineering. Topic: Solid Waste Threat.

## Reunions 1970

60th	'10	John B. Babcock, 3d 33 Richardson St. Portland, Maine 04103	M.I.T. Campus
55th	'15	Azel W. Mack 100 Memorial Drive Cambridge, Mass. 02139	Coonamesset Inn Falmouth, Mass.
50th	'20	Edwin D. Ryer Washington St. Duxbury, Mass. 02332	M.I.T. Campus
45th	'25	Edwin E. Kusssmaul 74 Highview St. Weston, Mass.	Bald Peak Colony Club Melvin Village, N.H.
40th	'30	Allen Latham, Jr. 66 Malcolm Road Jamaica Plains, Mass. 02130	Not Selected
35th	'35	Robert W. Forster Honeywell, Inc. 1230 Soldiers Field Road Boston, Mass. 02139	Catham Bars Inn Catham, Mass.
30th	'40	Not Selected	Not Selected
25th	'45	Thomas J. McNamara Engineering Research Ctr. Honeywell, Inc. 200 Smith St. Waltham, Mass. 02154	M.I.T. Campus
20th	'50	William J. Timson 14 Lawndale St. Belmont, Mass. 02178	Harborside Inn Edgartown, Mass.
15th	'55	F. Eugene Davis, 4th Mattern, Ware & Davis 855 Main St. Bridgeport, Conn. 06603	Not Selected
10th	'60	Thomas H. Farquhar 52 Mayo Road Wellesley, Mass. 02181	Not Selected
5th	'65	Steven B. Lipner 75A Marion Road Watertown, Mass. 02172	Not Selected

**Rochester**—January 2, Friday—Luncheon meeting, Small Hall, Chamber of Commerce. Speaker: Avery A. Ashdown, Ph.D.'24, Emeritus Associate Professor of Chemistry. Topic: Bridge the Generation Gap.

**St. Louis**—December 10, Wednesday—Dinner, Crest House, preceding a tour of the Spanish Pavilion including tickets to the play "Born Yesterday" with Marie Wilson at the Pavilion's Falstaff Theatre.

**Tulsa**—December 9, Tuesday—Luncheon meeting. Speaker: Dr. James R. Killian, '26.

Class Reunions—June 12-14, 1970.

Homecoming—June 15, 1970.

## M.I.T. Club Notes

Charles E. McCallum, '60, announced the formation last June of the M.I.T. Club of Western Michigan. Officers elected at the June 24 organizational meeting were: Charles E. McCallum, '60, President; Herbert F. Kanpe, '44, Secretary-Treasurer; Lyle F. Warnock, Jr., '55, and George W. Bartlett, '43, both to the board of directors. The first full meeting of the club is planned for this fall.

The M.I.T. Alumni of Long Island have planned four major meetings this winter:

Now a tradition, the fall dinner dance will be on Saturday, November 15, at McLaughlin's, Route 25A, Roslyn. The evening's feature is a talk with the fascinating



title "Extra Terrestrial Resources Luring the Space Explorers" by Ernest A. Steinhoff, M.I.T. Visiting Professor and Chief Scientist, Holloman AFB, N.M. The talk will be based in part on advanced studies by M.I.T. students and will include slides as well as some of the latest Apollo data. A social hour and dinner will precede Professor Steinhoff's presentation; live music for dancing before and after.

Following a Christmas lull, Long Island alumni will perk up the January doldrums with the Mid-Winter Beer Party, Thursday, January 22.

Friday, May 8 is the day for their Annual Meeting, elections, dinner and speaker

The year end event is The Family Picnic on Saturday, June 27. Watch for future announcements with specifics for each event. Since most mailings go to members only, be sure you are included; contact George Barnett, '59, 212 PE6-8000, for membership details and Ned Spencer, '46, 516 482-7976, for program information. Visiting alumni are, of course, welcome to attend M.I.T. club events.

#### M.I.T. Club of Thailand

Her Royal Highness Princess Ubolratna who is at present in Cambridge for her first semester at M.I.T. was guest of honor at the M.I.T. Club of Thailand dinner on September 6, 1969 at the Siam Intercontinental Hotel. A record number of 40 alumni, 28 with spouses, attended, making it the largest meeting since the club's foundation. Presented at the dinner were 33 Thai, 5 American, 1 Chinese and 1 Burmese alumni a mixed group indeed.

Phra Bisal Sukhumvit I, '23, Club President, recounted some stories of the Princess's grandfather who attended M.I.T. with the Class of 1921. An M.I.T. sailing jacket and an M.I.T. T-shirt were presented to the princess.

#### M.I.T. Club of Puerto Rico

Governor Luis A. Ferré, '24, addressing an M.I.T. Club of Puerto Rico banquet, expressed hope that his projected citizens feedback program would pave the way for a new form of pluralistic democracy, "that will leapfrog the immense problem of citizen alienation" facing modern society. By utilizing data processing and other forms of information retrieval he will be able to offer the public a more direct say in specific government programs, the Governor said. The feedback program, which Governor Ferré described as a marriage between science and politics, "should result in a government by anticipation instead of a government by crisis."

M.I.T. members of the Governor's Advisory Council for the Development of Government Programs introduced at the meeting were: Dr. Chandler Stevens, Co-ordinator of the Council; David Hoover '69, Project Co-ordinator of the Council; Paul Greenlee, '68, Project Supervisor; and Luis Salgado and Nigel Gusdorf, M.I.T. students working as summer interns with the Council. Professor John

Little from the Sloan School was introduced as the originator of the feedback program idea. Mr. Luis M. Rodriguez Lebrón, Vice President of the Club, presided at the banquet.

#### Deceased

Harold S. Boardman, '96, August 27  
 Anthony W. Peters, '01, June 18  
 Mrs. Frances R. Williams, '04, October 15  
 Leslie Clough, '05, September 21  
 Arthur E. Russell, '05, August 10\*  
 Huntington Smith, '05, August 9\*  
 Miss Rebecca Dodd, '06, December 28, 1967  
 Mrs. Sydney M. Williams, '06, September 11\*  
 Edward E. Bennett, '07, February 2  
 William J. Walker, '07, n.d.  
 H. Daland Chandler, '08, January 11  
 Paul W. Norton, '08, September 5  
 Calvin P. Eldred, '11, July 31  
 Paul G. Fraser, '12, June 20  
 Ward Gere, '12, June 19\*  
 Francis H. Kingsbury, '12, August 11  
 Arthur L. Brown, '13, October 20  
 John B. Woodward, '13, September 11\*  
 Frederick F. Mackentepe, '14, August 3  
 Verne C. Kennedy, '15, July 27\*  
 Vincent Sauchelli, '15 October 1  
 Robert R. Harkness, '17, May 1, 1965  
 Charles E. B. White, '19, October 17  
 John R. Bartholomew, '20, August 11  
 Edmund C. S. Bigelow, '20, September 11  
 Alton S. Pope, '20, July 8  
 Arthur N. Doolittle, '21, August 5  
 Earl M. Kilgore, '22, October 31, 1968  
 Andrew S. La Penta, '22, July 25  
 Samuel Sokolsky, '22, July 14\*  
 Joris M. White, '22, July 20  
 George R. Johnson, '23, May 20  
 Walter H. Newhouse, '23, September 21  
 John C. Byrne, '24, September 19  
 Fletcher G. Hamner, '24, September 17  
 Clarence P. Sullivan, '24, June 30  
 Howard S. Allen, '25, July 8  
 Alfred K. Morgan, '25, October 15  
 Richard J. Pitman, '25, August 26, 1968  
 Raymond T. Bete, '26, n.d.\*  
 Shepard Vogelgesang, '26, February 18  
 Douglas B. Walker, '26, April 6  
 William F. Bingham, '27, October 3  
 Harold C. Tingey, '28, August 22  
 Alfred H. Beckoner, '30, February 12  
 Tigris H. Kazandjian, '31, July 26  
 Dennis J. Curtin, '32, July 4, 1968  
 Miss Anna J. Haines, '32, July 28  
 Joseph L. Bird, '33, September 8, 1968  
 John C. Gale, '33, September 10  
 Robert E. Peters, '33, September 1  
 Robert H. Winters, '33, October 10  
 Lawrence A. Monroe, '34, July 22\*  
 Walter Regnery, '37, October 26, 1968  
 Frederick R. Dent, '38, September 10  
 Frederick L. Hoffman, '44, August 11  
 John P. Comer Jr., '48, October 13  
 Charles F. Hobbs, '48, September 16  
 James J. Brady, '59, April 11, 1966  
 Erhard J. Hofmann, '59, September, 1964  
 Maynard N. Toussaint, '60, July 18  
 Robert J. McKissick, '63, August 12  
 Subhash-Chandra H. Kotecha, '66, September, 1968  
 Roy B. Lindorf, '67, September 11  
 Louis M. Trager, '68, April 13

\* Further information in Class Review

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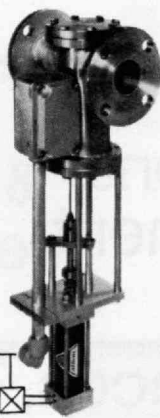
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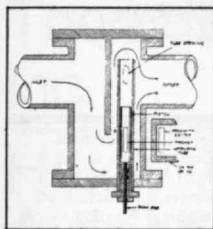
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(617) 864-6900, ext. 4871



## ALUMNI as noted

in their Class Columns by the energetic and hard-working Secretaries

**SEMINAR TONITE**

Gadzooks, me thinks he hath a Royal Flush!

Pierre F. Lavedan '20 gained national renown as a founder of an exclusive group, "The Shakespeare Study and Reflection Society"

At the U. of Alaska Alician Quinlan '68 has discovered a new dorm problem ~moose!

ADVERTISING.....mobile MIT variety. License plates of....

**MASSACHUSETTS ADMIT** **MASSACHUSETTS REMIT**

Roland B. Greeley Dir. of Admissions    Kenneth S. Brock '48, Alumni Fund Director

**PROGRAMMER**

**MODEL STAND**

ART NEWS: In a national competition of computer art, George Olshevsky '67 won third prize. His entry: "Oscillating Wastebasket"

Cranblueberry Apple Duff... **WOW!**

The JOY of CRANBERRIES & APPLES  
Supps & Whittigons & 1

Joseph C. Whitcomb '28, bank president, raises cranberries for fun and profit. Hermon S. Swartz '28, publisher, raises blueberries and apples for the same reasons. A joint cookbook in prospect?

Alumni record-holder? Probably.

Michael D. Pearlman '61 spent last April camping out at the North Pole

Robert D. Butler '32 has crossed the equator 3000 times. (Runs between his home and office in Brazil.)

**SAME OLD MP ARMY**

Charles Spann '67, MS candidate in Air Pollution, is now an MP!

Edwin E. Aldrin Jr. '63 set up a target on the moon

From Tucson, Arizona, Donald H. Eckhardt '55 scored a bullseye on it with a laser beam

For REAL Giant Steps: Sam (Bo) Pasternack Jr. '66 is one of a team designing a Lunar Pogo Stick (LUPS)

# Class Review

## 95

A telephone call to the nursing home revealed that **Luther Conant** is fine although confined to his room.

John Nolan, 1903 Secretary, called to say he has many memorabilia from the Class of 1895, acquired through the estate of Fred Richards. He is going to pay me a visit soon to share happy memories and, no doubt, a few laughs!

It was so good to see Dike Arnold, Alan Burke, Fearing Pratt and Sam Spiker at the luncheon.—**Andrew D. Fuller**, Secretary, 1284 Beacon St., Brookline, Mass. 02146

NOTE: The photo at the right shows Mr. Fuller receiving his Bronze Beaver.

## 96

As a result of the letter sent to all the members of the Class last June there are two changes in addresses for you to record. Mr. **William Barbour** is now in Berryville, Va., Box 463. A note from **Charles Hyde**'s son-in-law, Mr. Dunn, corrected the number on Marin Ave. from 2775 to 2275. He also gave a bit of news about Mr. Hyde who was then making a slow recovery from a slight stroke. He alternates, a few months at a time, between the homes of two daughters who live on opposite sides of the Bay in the San Francisco region. While flying between Hong Kong and Tokyo, your acting secretary sat beside an engineer who had attended Berkeley and who had only praise for his former professor, Charlie Hyde.

Since there were no volunteers to take over the job I'm trying to do, I'll continue to act as secretary as long as I can garner bits of news. Any help you can give me in a note to my address will be relayed to your classmates. With the New England fall at its brilliant best on an unusually warm October day, it is hard to realize that Christmas greetings will be the order of the day when this is in print.—Miss **Clare Driscoll**, Acting Secretary, 129 Walnut St., Brookline, Mass. 02146



Philip H. Peters, '37, (right) President of the Alumni Association, presenting the Bronze Beaver award to Andrew Fuller, '95. To Mr. Fuller's right is his secretary, Miss Ruth Burns; to his left his son.

## 98

Elizabeth F. Lambert wrote about her mother, Mrs. **Mabel F. Lambert**, '98, as follows: "My mother Mrs. Mabel F. Lambert, '98, is in much better health this year and attended a dinner at her son's house to celebrate her 93rd birthday on Christmas Day and also ventured forth for Easter and Mother's Day as well as Open House at the Red Cross recently. She eagerly reads the *Technology Review* and news of M.I.T. as well as the daily papers." We were very happy to receive your good news.—Mrs. **Audrey Jones Jones**, Acting Secretary, 232 Fountain St., Springfield, Mass. 01108

## 03

The first meeting of M.I.T. Class Secretaries in 20 years was held on September 4, in the plush lounge of McCormick Hall

on campus. Surprisingly, your 1903 Class Secretary was the "youngest" to attend as a considerable number were absent, probably saving themselves for the Alumni Officers' Conference which followed on September 5.

Sitting in an informal circular arrangement, we were a unique group ranging in age over five decades, yet not one was lacking in enthusiasm for his serious duty as Class Secretary.

The program was enlivened by prominent experts in alumni and higher education publications including John Bethel, editor of the *Harvard Alumni Bulletin*. Valuable aids were offered to stimulate our courageous efforts to acquire appropriate news for the *Review*. We were all in agreement that the laissez-faire attitude of classmates should be discouraged—that classmates should more willingly come to the aid of their Secretary.

There is some concern that too much publicity of those who reach a zenith in business and engineering acts as a deterrent to those equally zealous classmates who consider themselves to be less prominent. Your Secretary hopes that this does not keep any classmate from writing *him*. Our classmates families, accordingly, should have an equal interest in our reports and all secretaries will welcome news from them. We also learned that poetry is permissible in our reports, so:

Age is a quality of mind.  
If you have left your dreams behind,  
If hope is cold,  
If you no longer look ahead,  
If your ambition's fires are dead,  
Then you are old.

But if from life you take the best,  
And if in life you keep the zest,  
If love you hold,  
No matter how the years go bye,  
No matter how the birthdays fly,  
You are not old.

—**John J. A. Nolan**, Secretary, 13 Linden Ave., Somerville, Mass. 02143

## 05

Ed Murrow used to say on TV and before that on the radio, "If there isn't any news, just say so." Well there isn't much good news but the sad news just has to be reported.

August 9 was **Huntington Smith's** birthday. I had mailed him a birthday card, congratulating him on having reached his 93rd birthday. He was, incidentally, our oldest member having come to M.I.T. with an A.B. from Western Reserve University. Two weeks later I had a letter from Mrs. Smith stating that her husband had died on his birthday. She added, "He had a heart attack; was in the hospital only four days. Fortunately he had been in fine health up to the day he entered the hospital." I have sent her a note expressing class sympathy. "Hunt" died in Sarasota, Fla. He was president of Tech House, according to the Senior Portfolio. Who remembers what Tech House was? Incidentally this leaves **Bob McLean**, Course II, as the oldest member of our Class. Mark August 24 on your 1970 calendar, as Bob hits 90 then.

**Arthur E. Russell**, Course XIII, died on August 10, 1969, in Miami, Fla. The *Boston Herald* of August 12 carried this notice: "Word has been received here of the death of Arthur E. Russell, 86, at Cedars of Lebanon Hospital, Miami, Fla. He died Aug. 10. A resident of Medford for the greater part of his life, Russell was supervisor of draftsmen at Boston Naval Shipyard for nearly 40 years until his retirement 21 years ago. He was graduated from Medford High School and M.I.T. Russell served as deacon in Mystic Congregational Church, Medford, for many years. He leaves a daughter, Mrs. Ruth E. Strath of Melrose, and a stepdaughter, Mrs. Carolyn Orr of Bath, Maine."

His daughter has given us this brief data: "Dad had only been ill for about three weeks, although he had been failing in general health for the past year. He had been in a very nice Methodist retirement home in Miami for the past three years. I fear that when he realized that he would not ever be able to get out alone again, he just lost interest in living. I was so afraid that he would be cooped up in a nursing home for an indefinite number of years and was, therefore, planning on moving him back up north." I remember that Art worked at the Bath Iron Works for a few years, then was with the Boston Navy Yard and Watertown Arsenal.

**Harry Charlesworth**, Course VI, visited us at Hobby Knob on August 27. Harry doesn't drive much now, but he does a good job at hob-nobbing, a mighty good art when old friends meet. Here's hoping more will drop around and reminisce.

**Charlie Mayer**, Course IV, writes just to let us know he's alive and O.K. and financially able to pay dues. Merry Christmas and best wishes to you all for a pleasant holiday season.—**F. W. Goldthwait**, Secretary, Box 32, Center Sandwich, N.H. 03227; **William G. Ball**, Assistant Secretary, Box 8544 Bayshore Gardens, Bradenton, Fla. 33505

## 06

In reporting last month the death of our class president, **E. Sherman Chase**, I in-

cluded his membership in a few professional societies and associations. Since then I have received a more complete account—to quote: "Mr. Chase was an active participant in the work of professional societies, serving in official capacities and contributing over 100 technical papers. He served as president of the NEWW Assn. 1933-1934; of the New England Sewage Works Assn. in 1952; of the Federation of Sewage and Industrial Wastes Associates in 1953. He was a Councillor of the American Institute of Consulting Engineers 1957-60. The Annual E. Sherman Chase Award of the N.E. Pollution Control Associates was established in his honor in 1960.

"He was a recognized authority here and abroad in the fields of water supply and sewage and waste disposal. He held professional registrations in 13 states and was called upon many times for expert testimony in court cases. He was deeply interested in matters relating to engineering ethics and responsibilities." Sherman was a member of 16 professional Societies—American, British, and Canadian—and an Honorary Member of six of them. His contributions to and through those societies were truly significant, and his passing is keenly felt not only by his family and friends but also by his professional associates.

As acting Class Agent I have recently received a preliminary report for 1969 of the Alumni Fund but it is quite complete on individual giving since 1959. You may be interested in some of the data. It gives the total number in our Class as 559, of whom 97 are living and of those 97 the addresses of five are unknown. Prior contributors to the Fund totalled 66 and 26 had never given. Of the 89 names listed, 43 men and Mrs. Sydney Williams have contributed year after year while others did for a few years and stopped, or conversely, never did until a few years ago and have every year since, the result of changing circumstances no doubt. The six recent contributions "in memory of" I wish could have been credited to the 1906 Memorial Fund which the Class set up a few years ago, but such credit should be specified by the donor, of course.

We have recently been disposing of



various old collections and among them was the file of correspondence from and to me at the time of our fifteenth reunion at the Oswegatchie Inn in Waterford, Conn. It seems that I was doing the planning but for some unknown reason was not one of the 20 who attended. However Waterford has been frequently visited during the past 17 years as our son moved his family up there from Virginia in 1952 and lives very near where stood that old Inn—long since gone.

Back in June **Bill Sheldon** was up from Florida to spend the summer as usual at Barnstable on the Cape; **Jim Orme** was hanging his hat—if he wears one—at 201 E. 62nd St., New York, N.Y. 10021; the **Harry Fletchers** had been visiting his hometown of Portland, Maine. **Ernie Smith**, the latter part of August, was in Brightonview Convalescent Hospital in Avon, Conn., and I sent him a get-well note.

A while ago the Alumni Office sent me a long letter from **George Shingler** who had received a B.S. from Mercer University at Macon, Ga., before joining our Class junior year, and graduated with us in Course V, chemistry. He wrote: "I wanted all the years since graduating from Mercer to become a chemist . . . I decided on M.I.T." He was professor of chemistry at Emory College, Oxford, Ga., until 1916 and while there "I became noted as a professor who made M.D.'s out of the boys who took chemistry." He was specially interested in Naval Stores and devised a simpler method of distillation. He retired in 1950 as Chief of the Naval Stores Station at Clustee, Fla. An interesting and productive career George, and a well-earned retirement.

Our Class has just lost its oldest member—**Mrs. Sydney M. Williams**—who died September 11 at her summer home in Peterboro, N.H. She was born Mary Peele Hunnewell in Boston, November 17, 1875 and had lived in Wellesley most of her life after her marriage in 1908. She was with our Class during our 3rd and 4th years and was an Honorary Vice President of the Massachusetts Audubon Society, having served on its Board for many years. . . . The Alumni Office learned that **Frederick C. Line**, Course III, died May 26, 1967, as mail sent to his Rochester address had been returned, giving that date. He had always lived in Rochester, N.Y., and I believe had worked with the Monroe County Highway Department for some years.

When you read these notes Christmas will be in the offing; so Marion and I send our Best Wishes for a pleasant one even though it may not be a merry one. —**Edward B. Rowe**, Secretary and Treasurer, 11 Cushing Rd. Wellesley Hills, Mass. 02181

# 08

In quest of news for '08 notes I wrote to several members of our Class for a brief outline of what they had been doing since

leaving M.I.T. Among these was Colonel Rockwell who has since replied sending a copy of his biographical data on which I have drawn to write this report.

Colonel **Willard F. Rockwell** graduated from M.I.T. at the age of 20. He has proved to be one of the outstanding men in our Class. His first two years were spent as chief engineer with the Haynes Co., of Ayer, Mass., followed by three years with Bird and Son in Walpole, Mass., as industrial engineer. During the next two years he organized the consulting engineering service of Scoville & Co., of Boston. In 1915 he went to Cleveland as factory manager of Torben-son Axel Co., becoming Vice President in 1918.

During W.W. I he served as a specialist in the motor transport division of the Quartermasters Department of the U.S. Army with the rank of Major; he remained in the Army Reserve and was promoted to Colonel in 1930.

In May, 1919, he organized the Wisconsin Parts Co., of Oshkosh, Wisc., becoming its president for nine years. When it combined with the Timkin-Detroit Axel Co., in 1933, he was selected president of this company. In 1936 he became chairman of the board of Standard Steel Springs Co., of Coraopolis, Pa., a position that he held until September 1953 when this company merged with Timken-Detroit to form the Rockwell Spring & Axel Co. Colonel Rockwell was also board chairman of this new company. In 1958 the name was changed to Rockwell Standard Corporation to cover the other commercial products manufactured.

The Rockwell Standard Corporation is the worlds largest producer of mechanical elements for vehicles including drive trains, axles, brakes, universal joints, springs, and head and tail light assemblies. In W.W. II, Rockwell Standards produced the axles for 80 per cent of all heavy duty army vehicles.

The Aerio Command Division produces single and twin engine aircraft with all three propulsion units piston, propulsion jet and pure jet; the Industrial Division manufactures air and liquid filters and Murray cotton gin machinery; the Boston Gear Division is the world's largest producer of standard industrial gears; and the Draper Division is the world's leading manufacturer of textile weaving machinery including shuttleless looms.

In September, 1967, the Rockwell Standards Corporation and North American Aviation merged to form the North American Rockwell Corporation of El Segundo, Calif. of which Colonel Rockwell was named Honorary Chairman of the Board.

Let me take this opportunity to wish you all a happy Christmas season and a healthful and pleasant New Year.—**Joseph W. Wattles, 3d**, Acting Secretary, 1507 Casey Key Rd., Nokomis, Fla. 33555

# 09

After preparing the copy for the October-November *Review* describing the 60th reunion, we received some more notes from classmates. **Elliot Q. Adams** writes from Chagrin Falls, Ohio: "Sorry I couldn't attend the 60th reunion but I had no real hope of making it this year. When I went recently to funeral services for Dr. William E. Forsythe, for many years my immediate superior at Nela Park, one of those I met was your near-namesake, Charles L. Dows, who wishes to be remembered to you." As you may remember, Elliot attended our 50th reunion at Snow Inn. As may be inferred from his note, your Secretary was not only well acquainted with Charles L. Dows, '12, Course VI, but on more than one occasion we have received each other's mail. He was employed at Nela Park of the General Electric Company, Cleveland, where Elliot was also employed.

**Leonard Pritchett** of Westbrook, Conn., the son of our former M.I.T. President and also one of the top players on the class baseball team, writes: "Recovering from fractured hip and cataract operation, so have only one eye and one leg in practical operation."

**Herbert H. Palmer** writes: "Advancing years make activity on my part quite limited." . . . Blanche Johnson, widow of **Lewis Johnson**, still maintains her interest in the Class and often communicates with the Secretary. As will be remembered, her daughter and son-in-law, Dr. Sexton, and family attended the 55th reunion and earlier this year she advised us that all were most desirous "to be in attendance again." She writes from Rockland and Owl's Head, Maine, that her daughter's family is unable to make it and without them "I cannot go." She also states that the "Reunion at the New Ocean House—now gone—was a highlight for them all." She has requested that we send her the account of the 60th.

We previously reported in the *Review* the death of **George Washburn**. Mayo Hersey sent us an addendum according to his recollection. "George E. Washburn married Miss Hildegard B. Shumway of Bryn Mawr, Pa., August 23, 1927. Her father was a prominent oculist (M.D.) in Philadelphia."

In the past few years the Alumni Association has held an Alumni Officers' Conference early in September and we have made brief reports of the same in the class notes. The object is to acquaint these officers, including the class secretaries, with the activities of the Institute, its problems, and its objectives, thereby providing means to disseminate the information among the alumni.

The Conference opens the Friday morning after Labor Day and those attending are guests of the Institute. This year the Class was represented by Art Shaw and the Secretary. In the attendance list, which is arranged in the order of senior-

ity, we were at the top of the list. We are growing older! This year on Thursday afternoon there was also a conference of the class secretaries with John I. Mattill, editor of the *Review*, Brenda Kelley, editor of *Alumni News*, and others of the staff. Although your Secretary was most anxious to attend, his commitments prevented it. He learned that the conference was most successful.

President Johnson opened the Conference Friday morning citing the plans and concerns of the Institute today, an important factor being the proper balance in the curriculum between the humanities and the sciences. A panel of students and faculty members brought into focus the important issues and changes that exist today. In the afternoon the alumni were divided into smaller groups in which they were able to discuss more intimately with panel members and associates the issues presented during the morning session. Several alumni expressed forcefully their opinions on the attitudes of some of the students toward the universities.

On Saturday morning several members of the faculty told of recent research achievements in their respective departments. An interesting one was an analysis of the significance of the data obtained from the recent lunar landing and another was an investigation of the effects of cholesterol on heart disease. Much to our surprise the Institute has a small well-equipped research hospital in which patients with heart disease remain some time so that their heart action can be studied and possible preventive remedies determined.

We all remember **Florence Luscomb** who as a student studied architecture and in her early years after graduation worked incessantly to promote women suffrage. Subsequently, as these notes have sometimes recorded, she has been actively engaged in altruistic causes to assist the underprivileged. Recently she sent to an old friend, Ray E. Wilson, Secretary of the Class of 1912, a summary of her life's activities which we believe is most interesting. "It was such a pleasure to get your friendly letter, bringing back memories of those happy days at Tech so long ago. I'll go to my 60th reunion next June. No, I was not the only co-ed. In '09 Tech had 1,200 students with 12 of them co-eds. I too lived on Ashford St., (Allston), number 14, so your wife and I were neighbors. I acquired my stride (which has stood me in good stead all my life) by walking into Tech every morning with a couple of six-foot fellow students and, of course, we always got started five or ten minutes later than planned so we had to hump it.

"The first World War put me, as 98 per cent of America's architects, out of work. So I took a paid position in the field to which for years I had devoted all my spare time, namely the campaign to win votes for women. I became assistant executive secretary of the Boston Equal Suffrage Association which, when women were enfranchised in 1920, turned itself into the Boston League of Women Voters.

All my working life was spent as an executive secretary of various civic organizations, the last one being with the Women's International League for Peace and Freedom founded by Jane Addams.

"I have a little one-room cabin in the woods of Tamworth, N.H. (in a region of numerous charming covered bridges). I spend two and a half months there every summer. You asked about my health. I do all the work except plowing in a vegetable garden the equivalent of 50 feet square, plus a 150 foot flower border. I swing an axe to chop all the wood for my cook stove. Summer before last, at 80, I climbed 3,500 foot high Mt. Chocorua.

"The most interesting event of my life in recent years was a visit to China in 1962. I was a delegate to the World Disarmament Congress in Moscow and also to the Conference Against A and N Bombs in Tokyo. So I went from the Soviet Union to Japan by way of Peking, Shanghai and Canton. The interval between the two conventions limited me to 11 days in China, but they were days of wonderment and enlightenment, and by working 18 hours a day I saw a vast amount. I have talked about it and shown my slides to innumerable varied audiences, including student groups in almost all the colleges around Boston—except Tech!—and at Yale and Swarthmore. At the present moment most of my activities are devoted to trying to stop our infamous war against the people of Vietnam and to win justice for black Americans. I recently presided and spoke at a mass anti-war rally on Boston Common. So that is the story of my life." As Ray states: "She has had a most active and full life."

In the July/August *Review* we reported the death of Dr. **Henry C. Turner**. As stated, we wrote to Mrs. Turner expressing our sympathy and she has replied, enclosing an obituary. Dr. Turner attended M.I.T. and was graduated from Boston University Medical School in 1916, and received a master's degree from the Harvard School of Public Health in 1927. He was a member of the Massachusetts Medical Association; Examining Physicians Society of Massachusetts, Fourth Degree Knights of Columbus, the Order of Alhambra, and other organizations. He held many important positions such as Consultant to the City of Boston Health Department, Examining Physician for the city's Legal Department, Examining Physician for the Boston M.B.T.A. and the Knights of Columbus. In addition to his widow Alberta (Roosa), he is survived by two sisters Marie and Grace Turner of Boston.

Best wishes for a most pleasant holiday season to you all.—**Chester L. Dawes**, Secretary, Pierce Hall, Harvard University, Cambridge, Mass. 02138; **George E. Wallis**, Assistant Secretary, Wenham, Mass. 01984

10

From Rockport, Mass., **Albert K. Huckins**

writes: "Hope all goes well with you, as it does with me. A busy, hot summer with a record number of guests, mostly family. All over now—the town is gradually getting back to normal, much to my joy. Anticipate a leisurely fall and winter, quiet and peaceful."

Enclosed with the above note was a letter from **Allan A. Gould**: "Dear Al: Get braced for a voice out of the past! We just returned from a vacation on salt water and Barbara, my wife, was mulling over class notes in the *Review* and saw your note to Herb Cleverdon and the Rockport address. We were at the Rockaway Inn (or Hotel) at East Gloucester from July 31 to August 20 and I wish I had read the *Review* before I left home, for it would have been easy to have looked you up. We went over Marmion way a number of times in our cruising around. The three weeks went pleasantly enough with salt water swimming and sightseeing, though Rockaway has its limitations. Only sorry we didn't realize you were another possible attraction in the neighborhood. It sounds as though a fair number of the Class of 1910 expect to be able to attend the 1970 Reunion."—**Herbert S. Cleverdon**, Secretary, 112 Shawmut Ave., Boston, Mass. 02118

11

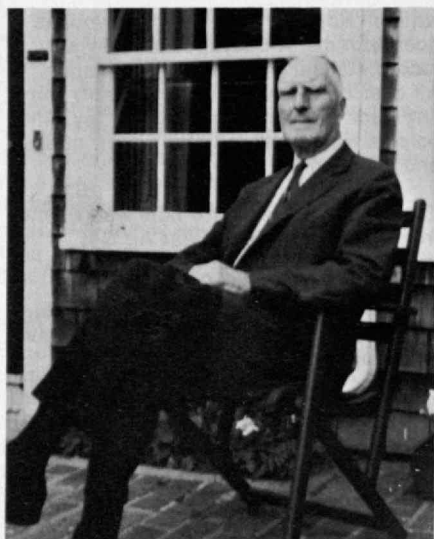
The following is from the *Yale Alumni Magazine* of last April which reported on **Edwin Pugsley** who graduated from Yale in 1908 as well as in electrical engineering with our Class.

"Ed Pugsley admits to being an incurable collector. Among his hobbies are watches, compasses, sextants, music boxes, clocks, pipe organs, and especially guns. Around 1951 Ed's gun collection numbered about 3,000 pieces and it represented a highly valuable record of the development of American firearms. At that time Mr. J. M. Olin, president of Olin Mathieson Corporation, desirous of establishing a gun museum, acquired Ed's collection, which now comprises over 90 per cent of the guns on display, making it the most comprehensive gun collection in the country. It is open to the public and has been viewed by over 200,000 persons since it was opened. If a classmate should drop in at Ed's house on Everett Street at five o'clock for a cocktail, innumerable clocks all over the house would strike the hour in unison creating a veritable symphony. There is an article about Ed and his gun collection in the *Olin Magazine*, current issue.

"Another of Ed's great interests is the Mystic Seaport and Historical Society at Mystic, Conn. . . . Among the many priceless old ships, exhibits and numerous buildings, is the Pugsley Clock Shop. To this and to the Society Ed has made many donations and for years has served on the board of trustees of the famed institution."

In August I had a letter from **Harry Tisdale** of Fort Meyers Beach, Fla., in which





O. W. Stewart, '11, relaxing at his 150-year-old Cape Cod "low single" on his Kingston, Mass., estate.

he promised to send me the story of his life. It hasn't come yet, but it is something for us all to look forward to. He says he is taking care of seven lawns and has worn out five lawn mowers in the past six years. Last spring he drove up to Nokomis and spent an evening with **Phil Caldwell** and his family.

The picture of **O. W. Stewart** was taken by Ray Wilson, '12, in front of the Stewart home in Kingston, Mass. It is a 150-year-old house that the Stewarts have thoroughly renovated and it sits on a 50-acre estate. Several years ago O. W., who is a dedicated horticulturist, planted several acres of cultivated blueberries and developed a mesh to put over the plants which kept birds from eating the berries. He was president of the blueberry growers association. Though of late years the blueberry patch has been rented out, he still raises flowers and vegetables and has favored me with some of them. O. W. has been very active in civic matters, particularly for his church and the W.M.C.A. As you all know O. W. is Class Agent for the Alumni Fund and really works at the job. Lets all support him.

From **Allston Cushing** along with his Alumni Fund contribution last spring: "Am living on pension, interest, dividend, etc. in retirement. Wife and self in good health. Possibly the youngest member of my class. I will be 80 next March." . . .

From **Livingston P. Ferris**: "Keeping busy looking after Ashton Plantation. Hope to get back for another reunion. Highly favor M.I.T. keeping up work for the Department of Defense." . . . From **Stafford Francis**: "My wife, Marion Putnam Francis, sister of Scott B. Putnam, who died in El Paso, Texas, after an appendicitis operation shortly after graduating from M.I.T. in 1911, passed away on January 2, 1969, in the local Lykes Memorial Hospital in Brooksville, Fla., entered November 2."

Now is the time to wish you all a Merry

Christmas and a good New Year.—  
**Oberlin S. Clark**, Secretary, 50 Leonard Rd., North Weymouth, Mass. 02191

## 12

DO YOU REMEMBER our freshman tug-of-war team which beat that of the sophomore class? It was captained by **Cornelius Duyser** and had 24 men. A minimum weight of 150 pounds was required to be eligible. I weighed only 148 pounds but wanted to make the team so badly that I put slabs of lead in the bottoms of my shoes before weighing in. Due to my peculiar gait, however, the ruse was discovered and I was thrown out.

Last August Helen and I took a unique and relaxing cruise on the river steamboat, *Delta Queen*, which plies the Ohio River from Pittsburgh to Cairo, the Tennessee River from Pauducah, Ky., to Chattanooga, Tenn., and the Mississippi from St. Paul to New Orleans. Due to a recent government regulation prohibiting wood construction on "ships at sea," this fine old relic of our heritage must cease operation after one more year, despite the fact that the boat has a steel hull and is fully sprinklered.

This 285 foot sternwheel steamer carries nearly 200 passengers and has a speed of less than 10 miles per hour. The wheel is 26 feet in diameter and the steam engines have a 10-foot driving stroke. Attached to the bow is a 100-foot, 8-ton "stage" or gangplank which is swung ashore for all landings. We took one of the shorter cruises, from Cincinnati to Kentucky Lake and return. This was 500 miles each way and took nine days. We passed through 12 locks. Daily stops were made at river towns or points of interest, which included Cave-in-Rock, an old pirate cave where unwitting boatmen were once lured ashore to be robbed and murdered.

The river traffic was surprisingly heavy, consisting mostly of long barges, tied together in groups of two to eight. They carried mostly coal, oil and grain, and were pushed by heavy tow-boats, designed for the purpose. There were also many speed boats, pleasure cruisers and houseboats. Nightly entertainment and dancing was furnished by an old-time orchestra and singers; movies made in the twenties were shown.

The steamer was equipped with a steam calliope which drew crowds to the river banks of every landing. I was allowed to play the instrument and was awarded a certificate on parchment stating that I am "qualified to play the steam calliope on all navigable waters of the United States," a doubtful privilege, since there will soon be none afloat.

A brief note from **John Selfridge**, Course VI, states that he celebrated his 80th birthday last June and is still going strong. Both he and his wife are in good health. They also celebrated their 55th

wedding anniversary on September 12. Our congratulations and best wishes from all the members of 1912. John spent many years operating the California Commodity Exchange, Ltd., of San Francisco and retired in 1954. He has since kept busy with various odd jobs. Jack's family live near him in California; he has ten grandchildren and two great-grandchildren.

We received good news from **Ernest DeWitt**, Course II, who writes as follows, "First, I wish to acknowledge receipt of the four communications from you and to apologize for not writing sooner. After graduation I spent five years with the Grey Iron and Malleable Iron foundries of East Cambridge, Mass., as engineer in charge of the manufacture of castings, not only at this plant but also in Dayton, Ohio, Cincinnati and Detroit. In 1920, I accepted a position with the International Harvester Co., in Chicago where I continued until my retirement in 1950. I was married in 1914 and after many happy years, my wife passed away in 1960. I soon moved back to Osterville on Cape Cod to the old homestead which my grandfather built 106 years ago. Here in 1962, I married my present wife, a widow of 18 years, whom I had known since school days. I am now 84 years of age, in perfect health, have all my teeth and hair, and hope to be about for at least a few more years. I am most fortunate to have a large family of children, grandchildren and three great-grandchildren, who visit me here and keep the house filled every summer. As I look through the recent *Technology Reviews*, I would say that you can be proud of your results in obtaining news of so many in the Class of 1912."

**Dave Follett**, Course III, writes, "I was superintendent of the New England Lime Company, Adams, Mass., from 1911 to 1961 and vice president and superintendent from 1947 to 1961, when we merged with Charles Pfizer & Co. and I remained as consultant for three years. I also served as vice president of the Greylock National Bank for 16 years and as president from 1956 to 1961, when we merged into the Berkshire Bank and Trust Co. Here I served as chairman of the executive committee until 1964 and am now an honorary director. Due to eye trouble, resulting in poor vision, I retired from active business in 1964."

We regret to report the passing of **Ward Gere**, Course VI, which occurred in Syracuse, N.Y., on June 19. His wife, Mary, writes that Ward had an operation last year in November, following which they spent the winter in Florida, hoping for his recuperation. He improved little, however, and last May he fell and fractured his hip. He was improving satisfactorily but just before he was to be discharged from the hospital, he suffered a stroke and died three days later. We have written to Mrs. Gere expressing the sympathy of the Class of 1912 to her and the family.

**Willis Salisbury** sends a note promising to write the story of his long and most



interesting trip, from January to April, 1969, down the west coast and up the east side of Africa, followed by brief stops in Athens, Belgium, Holland, London and Edinburgh. Knowing Willis' ability as a journalist, we may expect a real treat. He wrote us from his summer camp at Hungrey Jack Lake in northern Minnesota, only two miles by canoe from the Canadian border. Already Willis is planning another trip for next spring, covering Australia, New Zealand and then to the Fair in Japan. We shall publish the story of his last trip in the next issue.

**Arch Eicher** is slowly recovering from his heart attack and is now able to navigate with the help of a cane, according to a letter received from his wife, Agnes, in September. We know he will be glad to hear from any classmates.

A letter from the daughter of **Luis Gonzales**, Course XIV, of Puerto Rico advises that he had been enjoying good health until a year ago when he suffered a stroke and has since been confined to a wheel chair. Luis had managed a large fertilizer business in San Juan for many years. Last January he celebrated his 82nd birthday with his wife, four daughters, three sons-in-law, fourteen grandchildren and fourteen great-grandchildren. Very best wishes, Luis, from the Class of 1912.

**Gerald Howard**, Nashville, Tenn., Course I, wins the prize for the shortest contribution which reads, "Have retired from business." Since he will be 82 years of age in December, this is a commendable record. We believe Gerald spent many years with the Southern Engineering and Appraisal Co., in Nashville but have written him for more details.

**Ken Barnard** reports the arrival of two new great-grandchildren. He has also heard from his grandson in the Navy at Okinawa that he is planning to adopt two Korean orphans. These will make a total of 10 great-grandchildren.

On September 5 and 6, **Al Davis** and I attended the National Alumni Officers' Conference in Cambridge. There were some 700 present, faculty, alumni and student representatives. The theme of the conference was "Changing Roles in the Institute," which included the educational and research policy as well as community service with its attendant problems. As pointed out, engineering education was formerly applied, not abstract, whereas today it must deal with specific subjects, not only in industry and war related research, but to the more local needs of the community. Panel discussions followed in which all groups took part, on the many subjects affecting the changes made necessary by current issues, both on the campus and in the community. The detailed story of this stimulating conference appears in this issue of the *Review*, pp. 100, 101.

We have heard from a few classmates that they are in favor of holding a 1970 reunion and Al Davis is making inquiries

as to facilities at several places on the Cape. You may expect to hear from him shortly, if you do not already have a letter. A prompt reply is necessary in order to make the necessary guarantees.—

**Ray E. Wilson**, Secretary, 304 Park Ave., Swarthmore, Pa. 19081; **Jay H. Pratt**, Assistant Secretary, 937 Fair Oaks Ave., Oak Park, Ill. 60302

## 13

The Alumni Officers' Conference of 1969 was most enjoyable and beneficial to all of the officers and accompanying wives. The various panels were very efficient. The members of these panels carried out their assignments capably, representing faculty as well as student members (see *Technology Review* for December, 1969, pp. 100f). The Secretaries session held on September 4 was one of the highlights of the Conference. The success of the meeting was due to efficient planning and leadership of Don Severance, '38, Publisher, John Mattill, Editor and Brenda Kelley, Alumni News Editor of the *Technology Review*; also Fred Lehman, '51, Secretary, and Panos Spiliakos, '66, Assistant Secretary of the Alumni Association.

Frank Stern, Class of 1916, notified us that **Edgar Weil** of 1913 and his wife will celebrate their 45th anniversary on September 16, 1969. Your Secretary sent a congratulatory card to New York City where Frank Stern and other friends will meet at the Dorset Hotel to participate in an anniversary celebration.

**Heinie Glidden** is still in his retirement, painting and exhibiting his accomplishments at many art exhibits in southeastern Massachusetts. He relates, and we quote: "Still up to the old game of painting. Many of those shown in the exhibition were made while on trips around the country—New Brunswick, Maine, Florida, California, as well as near home in Massachusetts—47 in all. Also had one in the Brockton Art Center in their Showing of four works from each of the South Shore Art Associations and two at the Norwell Art Association Annual Exhibition. A good way to keep out of mischief! Sorry we couldn't make the Alumni Luncheon this year."

The following is quoted from the May 3 Brockton paper: "Henry O. Glidden will excite the art-loving public as he opens his one-man show at the Brockton Universalist-Unitarian Church Wednesday, May 7. An Abingtonian, Henry is well known throughout the area as a master with the brush who has a keen mind and a deft hand. From his multitude of experiences comes an outpouring of life as he sees it; and this rich collection will be presented to the public at an opening tea, May 7. . . . He studied cast and life drawing, theory and color, and watercolor painting under Prof. W. Felton Brown. He also studied watercolor under Ross Turner, color design with C. Howard Walker, pen and ink and pencil rendering under David A. Gregg. A course under Denman

W. Ross at Harvard Summer School, while still in high school, provided a foundation for these later studies. During his years of architectural practice there was little time for painting, but the desire was there and thus, during lunch hours from his Copley Square office he could be found painting Charles River boat scenes from a vestpocket watercolor kit. . . . Another highlight of Henry Glidden's background is evidenced in the 27 pen and ink book illustrations he rendered in three weeks' time for a New York publisher when the commissioned artist could not complete his contract. In this emergency, Henry's father, a co-author of the book, prevailed upon his son to do the work."

**Kenneth Hamilton** states: "Still above ground but getting older. Will send you a good news report some day, but can't tell when." . . . **Edward E. Jewett** states: "No news is good news." . . . **Merrill J. Smith** writes: "We had mud flow in our back yard due to record breaking rain in February and March, approximately 48 inches of rain in about nine days. No structural damage, all in good shape now, but had us worried for a while."

**Lloyd A. Hechinger** writes: "Retired science teacher, Boston Latin School. Now associated with Chamberlayne Junior College, Boston." . . . **Marion Hart**, our lady flyer, still makes headlines: "Mrs. Marion Hart stepped down from her single-engine plane in Prestwick, Scotland, after a solo flight across the Atlantic via Iceland. She glanced up at the cloudy sky and said: 'I'm going in search of the sun for a holiday. I don't know where—but it will have to be somewhere nice and warm. It was much too cold in Iceland.' Mrs. Hart, who is 77 years old, said she got her flying license 23 years ago and now has logged 4,500 hours flying time."

Again **George Wallace** makes the news. Gordon Howie, Clearwater, Fla., forwards to your Secretary a clipping from the *Worcester Telegram* which was sent to Gordon by his daughter, who lives in Worcester: "It was champagne, not money, that passed over the counter at the Fitchburg Savings Bank yesterday. A champagne party was held at the bank in honor of George R. Wallace Jr., an industrialist who has given the city more than \$2.75 million for civic projects. Present at the \$1-a-glass gathering were many city officials and businessmen. After the champagne party, there was a \$3-a-seat showing of the Charlton Heston movie, "Number One", which had its New England premiere Friday in Boston. The money raised will go to the Wallace Creative Citizenship Award fund. Each year Fitchburg students will be given awards from the fund. . . . The awards will be given to students showing the most enterprise in creative projects. Plans have been made for the projects to be displayed in the Wallace Civic Center now under construction. . . . Another honor for the industrial-philanthropist will be George R. Wallace Day, to be held Sept. 7 at Coolidge Park. It will include a bar-

becue and presentations by local bands. The man being honored with all this activity is, according to Mayor William G. Flynn, 'the only man in town who doesn't like the idea. He wanted to give all the money himself and get it over with.'" Next to the Civic Center will be the Alice G. Wallace Planetarium, named after George's wife.

**Dave Nason**, as usual when he writes, gives us retirees a great deal of inspiration in outlook: "Two completely unrelated coincidences prompt this note, i.e. (1) I just read your Class Notes in the Summer Edition of the *Tech Review* and (2) I am about to go fishing in a remote part of the Canadian Arctic. You are certainly hard up for Class Notes when you publicly seek information from piscatorially inclined classmates. Frankly, Phil, I am very happy to have lived so long and my life is dedicated to doing what I can still do, after having done what my wife and children tell me to do. Phil, do you remember when you worked for Elmer Chain in Peabody? Do you remember when 'Jumbo' Mahoney brought samples from the Everett Distillery to Wellfleet? Well anyhow, I get a lot of fun out of recalling the events of a misspent youth and, without regret. You do an excellent job on the *Tech Review*. You should have gone to Harvard and cultivated an accent. The problem now, at the age of 79, is that most of our intimate friends are gone and you cannot start in with new ones now. Your successful effort to recall the past, as you did in your remark about Bill Mattson, is a great tonic and well worth reading. Give the Kennedys enough rope and you will make Massachusetts want Coolidge back. We will go to Barbados in December and, as usual, you will get a card. But don't get 'sassy' as a card from me is an honor-indeed!"

Once again, we congratulate one of our still active classmates—**Benjamin F. Thomas, Jr.**, for his well deserved promotion and we record: "Benjamin F. Thomas, Jr. has been appointed Chief Electrical Engineer and assistant manager of the newly formed mechanical and electrical consulting department, it was announced today by Richard H. Tatlow, III, President of Abbott, Merkt & Co., a New York-based firm of architects and engineers. This newly created department will specialize in electrical and mechanical engineering consultation. Mr. Thomas has been associated with Abbott, Merkt & Co. for the past 15 years. He holds an A.B. and A.M. degree from St. Louis University and a B.S. in E.E. from M.I.T. He is registered in a number of states and has been active on the Industrial and Commercial Systems Committee of the I.E.E.E. He is listed in *Who's Who in the East* and *Who's Who in Engineering*."

We have recorded several notes of appreciation from the families of departed classmates to whom we have sent cards of sympathy, namely, Charles Edison, Lawrence Kocher and Arthur Howlett.

To Jack Farwell we are indebted for the

very sad news of the death of **John Woodward, Jr.**, of Newport News, Va., from a *New York Times* clipping.

"John B. Woodward Jr., who headed the Newport News Shipbuilding and Dry Dock Company in its World War II production of aircraft carriers and other Navy vessels, died here today. He was 81 years old. In 1936 Mr. Woodward was named general manager and a director of the company, whose engineering staff he joined in 1914. He became vice president and general manager in 1940 and president in 1946. He was chairman from 1953 to 1960. He then became a director emeritus, but continued as a consultant. He was born in Richmond on Nov. 6, 1887, graduated from the Univ. of Richmond in 1907, and taught mathematics at Denison University. He then attended the Univ. of Virginia and transferred to the Massachusetts Institute of Technology where he received a B.S. degree in mechanical engineering in 1913. For his work in guiding the war productions of the shipyard, he received a Navy commendation and, in 1951, the Navy Distinguished Service Medal.

"He was president of the Society of Naval Architects and Marine Engineers in 1949-1950 and received its Admiral Jerry Land Medal for achievement in the marine field in 1954. He was chairman of the executive committee of the Shipbuilders Council of America from 1958 to 1960. Mr. Woodward served as chairman of the board of the Federal Reserve Bank of Richmond from 1954-58. He was a trustee of the University of Richmond and a former rector of the College of William and Mary. Surviving are his widow, the former Rosa Lee; a son, Dr. John B., III, and seven grandchildren."

**Jack Farwell** writes, and we quote: "John was in Course II, I knew him very well—a real fellow. Hope you and Roz both fine. Everything the same with me, with the help of tractors, chain saws, mowers, etc. keeping me in form. Am waiting patiently for the next reunion—make it early." Well! Boys and Gals, keep the news coming; no news, no notes.—**George Philip Capen**, Secretary/Treasurer, 60 Everett St., Canton, Mass. 02021

## 14

We had a phone chat with **Frank Atwood** a few days ago. You will recall that he has been a resident of the Edgartown area since he retired from the paint research business in 1949. In addition to a certain real estate business, he and his wife have a well patronized resort motel which is frequented by many who are in the public eye. The character of the clientele has always been beyond reproach and will undoubtedly continue to be so although a few outsiders have made suggestive passes since the Kennedy affair. He has been amazed at the combing over of the area given by the press. He mentioned, for example, being quizzed by a representative of a German magazine who was preparing an exten-

sive article on the Kennedy business. Incidentally, we judge that he feels that the *New York Times* reporting was probably as fair as any.

The contact with Frank brought out the fact of his earlier career in the paint development industry. A clipping dated June 6, 1969, from a Boston newspaper reads: "F. C. Atwood is Honored by N.E. Paint Society: F. Clarke Atwood of Edgartown, more particularly of Katama, is honorary chairman of the 50th Anniversary Committee of the New England Society for Paint Technology. He made a trip to Boston on Tuesday and with his 'paint friends' as he appropriately calls them, assembled in the office of Mayor Kevin White and walked the few hundred yards to the Boston Paint Stone for photographing. Mr. Atwood found Mr. White a charming individual.

"Although New England and especially Boston have been in the fore of paint manufacture in this country, it was not until 1919 that the men who made the paint got together and formed an organization to discuss their technical problems. So this is the semi-centennial year. Mr. Atwood was president of the group in 1930 and in 1933 was president of the National Federation of Societies for Paint Technology.

"The symbol of paint manufacture is the 'Boston Stone' on Marshall Street between Hanover and Union; this stone is reputed to be the one used in the first manufacture of paint in America. . . . A book with much detail about the association is to be published by the Harold Cabot agency in Boston. . . ."

Here's a note from our roving reporter **Alden Waitt**: "Dear Herman: It was great to see you and the Class of '14; the 55th reunion was an unqualified success. My thanks and congratulations to the officers of the Class and to Ham and Wilkins. A swell job! Here's hoping we can make another one. Since I last saw you Kathryn and I have been moving around considerably, killing time until the cottage we have rented on Cape Cod is available for us. We rented it for August but hoped to occupy it earlier. The post card enclosed gives the itinerary and I suppose I'm sort of bragging in detailing our travels but I feel it is pretty good to be able to keep moving so fast and far after celebrating 55 years out of M.I.T. Anyway forgive the brags and accept the fact that in 55 years I haven't acquired any modesty.

"We started over here in Nashua to see Clisham and I had a nice afternoon with him looking at his paintings and the places he likes to paint around here. We all had a pleasant dinner at his favorite eating place in Nashua and a very pleasant time. I enclose a clipping he sent me a couple of months ago as it is an excellent likeness—as he is today. He has done a lot of fine work and his landscapes have a warm comfortable and homey feeling. While he was showing me the painting a family came into the studio and looked the work over and bought



one, a very nice local scene. I'd call it a successful day. Hope this finds you well. Our very best wishes. Alden." The clipping about **Ormonde Clisham** tells of the Art Mart where he has set up his easel and oils at a "Bizarre Bazaar."

Here's a note from **H. S. Busby** which shows that we have at least one philosopher in the Class: "Dear Herman: Seeing a notice in the paper recently, of the arrival of a freighter from Chelsea, Mass., stirred up things that would not go away until I had written out what is inclosed. (I must admit that living again under the Bell Telephone service, after four years of frustrating experience with an "independent" telephone company in Brevard, probably also had something to do with it.)

"Anyway, you, as an old telephone man will appreciate what it means to be "in communication," so I thought you should read it. In spare time I often write down things that boil up to the surface—it is relaxation from tasks.

Here is Busby's enclosure: "What makes a Chinese go back to his native land to die? That urge certainly transcends any hope of finding tranquility there because some eminent Chinese scholars have returned to China since Mao's regime came to power.

"It may be much more than a premonition that he has lived out most of his days. It may be, in fact, that he feels that he has to experience again contact with people and episodes that keep recurring in his memory—contact with Utopia, fancied or real—except that it satisfies and completes because it is Utopia more realistically associated with the beginnings of his life than are any of the misty portrayals of his life's effort or are any of the philosophical ones. The oriental mind is more likely to confront, realistically, latent impulses than the occidental one—the occidental, unconsciously perhaps, buries these impulses underneath a layer of frustration.

That urge to return surges to the fore when you read, in the daily paper, that a ship has just come into port all the way from your more than a thousand miles distant boyhood home. It appears again when the name of one of your boyhood associates, now famous, appears in print. It bursts through your musings also when you read about the resurgence of some principle that you were taught, accepted, and lived by, while you were living those formative years. Whatever it is, the spirit 'turns again home,' and seeks to override every barrier of those hard-won current benefits of your present domicile—climate, cost of living advantage, and current associations that group themselves around where you are living now.

"Seemingly, you feel that that urge will never be satisfied until you have, by some means, revisited that old environment—walked its streets, identified old landmarks, sought for traces of families long since gone, and have felt again the

old environment itself. And if you do go there practical considerations may even cut short your visit. Nevertheless that urge still remains and it dogs all of your day dreams.

"So, shall we pack up and make this visit—perhaps at great inconvenience and dislocation of budget—just to satisfy or to quell a day dream? In this dilemma modern communications help quite a bit—as long distance telephone rates continue to be lowered it becomes possible to reach a friend up there in the old environment and to make a reminiscent visit with him—at a cost far below that of any means of personal travel. It's worth the attempt, and it just may pull back into line and control that latent restlessness that besets so many of us these days, one by-product of which is that urge to revisit the environment of our most cherished memories.

"We are (indeed) the stuff that dreams are made of,' and a goodly portion of those dreams may be satisfied by that very direct contact of the spoken word."

We have a report of the death of Colonel **Lucian Wallace Burnham** at his residence in Pasadena, Calif. He retired in 1948 with the rank of Colonel after a lifetime of military service; he enlisted in the Marine Corps shortly after graduation, responding to the call for help by his country at a time of need. By 1918 he attained the rank of captain. His assignments included many in this country and abroad including Cuba and Ireland. The Class expresses deep sympathy to Mrs. Burnham. —**Herman A. Affel**, Secretary, Rome, Maine RFD 2, Oakland, Maine 04963

## 15

Brenda Kelley, the editor for class notes, has done an excellent job for the *Review* and for us Class Secretaries with her constructive help and business-like organization and handling of our notes and problems. The mortality in her job in the Alumni Association office has been unfortunately high, so we sincerely hope she stays. The following clip shows her interest and is an apt description of this Secretary's job. But, it's a good job and I like it; so with your permission, I'd like to keep it!

"Although the following quote is from the *Princeton Alumni Weekly* ("The Care and Feeding of a Princeton Class") of May 20, 1969 and though you may breathe a sigh of relief at producing only nine columns a year, the picture it presents is otherwise as true a one of you as of a Princeton secretary: 'Another key man in setting the standard for class performance is the Secretary. His job is the most demanding of all the project managers. The outward sign of his office is the class column which must be filled thirty times a year. Less visible assignments are the preparation of class memorials, the location of lost classmates, the maintenance of records and the collection of class archives and dues. He needs a total ac-

quaintance with individual classmates and a deep interest in their activities. A good Secretary becomes a one-man employment bureau, advertising agency, and public relations firm, as well as the prime creator of class spirit.' "

Present at Alumni Day activities at M.I.T. were: Larry Bailey, Marjorie and Whit Brown, Jack Dalton, Virginia and Hank Marion, Archie Morrison, Ardelle, Marion and Wally Pike, Pirate Rooney, Bill Smith and charming guests Ruth and sisters Florence and Charlotte, Barbara Thomas, Helen and Fred Waters, Pop Wood, and Max Woythaler. Most of these continued on to our gay class cocktail party and dinner at the Faculty Club and later to Bill Smith's "Cloud 19." A fine crowd. Rus Ambach, Chairman of the Class of 1924's 45th reunion, sent me a glowing report of their doings at Bald Peak Country Club, in the New Hampshire White Mountains. It's good to see this "younger" class enjoy such a gay and successful reunion.

Helen and **Phil Alger** had a restful summer at their place "Hubbardstone," Rumney, N.H. Phil has an article in the *IEEE Spectrum* for August, "The New Responsibility of the Engineer."

In *Frank Kane's Licensed Beverage Review* for April, a fine recent picture of **Sam Berke** goes with this informative story. Sam is President and Chairman of the Board, Mr. Boston Distiller Inc., Boston, Mass., Chairman of the Board, The Viking Distillery, Inc., Albany, Ga., and Board Chairman, Clarendon Products Corp. Prior to joining Mr. Boston, Sam worked in mechanical, electrical and chemical engineering with Worthington Pump and Machinery Corporation, 1915-1919; with Robert W. Hunt and Co., Consulting Engineers, 1916-1918; and as a manufacturer of automobile parts from 1919 to 1936 as president of several companies. Presently, he owns and operates a Guernsey breeding establishment and milk farm in Lakeville, Conn. He is Vice President and Trustee of the Indian Mountain School, Lakeville, Conn.; Member of the Development Committee of M.I.T.; Director of the *Lakeville Journal*; and Member of the American Guernsey Cattle Association, Peterborough, N.H. You wonder what Sam does with his spare time.

**Ted Brown**, Manchester, Conn.: "Just to say hello to the class gang, especially Ben Neal and Larry Bailey." . . . **Don Fowle**, Woburn, Mass.: "I am still alive and kicking although confined to my home under the doctor's care and not allowed to drive. Best wishes to you and '15."

**Bill Harbaugh**, Allentown, Pa.: "I'm in reasonably good shape, I believe. Not too active but still can manage to play golf two or three times a week. It is only about three minutes from my home to the club. My only other regular activity is reading your nice column in the *Review*. You always do an excellent job. I will be 80 in June, somewhat older than most of



you but I had an A.B. degree before entering Tech." Thank you very much, Bill.

While driving through the New Hampshire White Mountains last summer, Fran and I stopped to see Madelaine and **Doug McMurtrie** in Gorham, N.H. They are enjoying Doug's retirement from Brown Co. in near-by Berlin, N.H. Their four sons, one daughter and 17 grandchildren are scattered all over. With all this family around, they celebrated their 50th wedding anniversary in July and were going to Paris in August to see their son over there. What an energetic couple!

In August Fran and I spent a few days with **Ben Neal** and his daughter Barbara at Ben's old summer place on Cushing's Island, Casco Bay in Portland (Maine) Harbor. Among the 20 families living in the summer on the island there is an unusual and friendly camaraderie. The daily arrival of the ferry from the mainland is a big event. Everyone walks everywhere and Ben did me in with some strenuous tramps through the rough country roads and along the rocky shores. Barbara and Ben are the only people we know who can get and serve Jack Daniels followed by charcoal broiled steaks one night and fresh Maine lobsters another. It was really good eatin'. Ben's a dedicated worker, for even down there he had his class files and was working on the Alumni Fund records.

Just think how **Mary Plummer Rice** keeps going—an example for a lot of us. In August on a postal from Tokyo she wrote: "This is an unattractive city. My daughter does the sight-seeing for us both and I spend my time at the U.S.O. Club and the Medical Center, where I was enthusiastically received. The Red Cross director has arranged for an Army bus to take me to Zamba Hospital where the Vietnam wounded are flown in from Saigon. I go to Hong Kong next and then to Saigon." What a colorful experience for Mary. Our admiration to her for her interest and work for U.S.O. and service men.

On July 18 at Saint Jerome Church, Arlington, Mass., Bill Sheils daughter, Marie, (Henry's granddaughter) was married to Mr. Francis E. McCormack, Jr. All the best to this nice young couple.

Opal Purinton wrote us about the sad loss of Foss [**Forrest Purinton**], who died on July 14 in Middlebury, Conn.: "After Foss's serious heart attack ten years ago his activities had to change from mountain climbing, tennis, sailing, photography to quieter pursuits. Painting became an absorbing hobby and he taught himself largely by reading and museum study to be a quite good artist. . . . tape recording became another absorbing interest. Like most engineers he researched each hobby thoroughly. This last winter his circulatory system was giving him trouble yet we daily walked the beach and exercised in the pool. He was to go into the hospital again for surgery but instead another heart attack took him very quickly after being home in Connecticut

just two months. The family had all been with us in Naples, Fla., for his 80th birthday in March which he was proud to have achieved. He was always glad to have made his class's 50th reunion."

Prior to his retirement he was the chief engineer for the Waterbury Patent Button Co., and served as first selectman in Middlebury from 1955 to 1957. A veteran of World War I, serving in the U.S. Army as a captain, ordnance department, he was also a member of: Phi Beta Epsilon, the Board of Directors of the Y.M.C.A., the Visiting Nurses Association, Appalachian Mountain Club (life member), the American Society of Mechanical Engineers, the University Club of Waterbury (charter member), the Waterbury Club, the Highfield Club and the Governor's Footguard.

He is survived by his widow, Opal (Fisher) Purinton of Middlebury and Naples, Fla.; three sons, John H. of Middlebury, Charles M. of Newfane, Vt., and Robert L. of Los Angeles, Calif.; one brother, Perley of Beverly, Mass.; seven grandchildren and several nieces and nephews.

**Verne C. Kennedy** died in Chicago on July 27.

We are having our annual fall class dinner on October 24 at the M.I.T. Faculty Club in Cambridge. It will be reported later. How about some letters telling of yourselves, your families, your retirements, your hobbies to "help Azel."—**Azel W. Mack**, Secretary, 100 Memorial Drive, Cambridge, Mass. 02142

## 16

As we look forward to the cheerful Christmas season, scan again the sparkling class picture of the 53rd reunion last June, and begin to think about the 54th at Chatham Bars Inn next June, let us stop for a few minutes to read some of the messages from classmates, far and near. Many speak of the uncommonly wet early summer, with rainfall more than double that recorded as the "average for the month."

**Howard Claussen**, writing from Cotuit, Cape Cod, in late July to one of us on the New Jersey shore (where we could commiserate with him roundly), had this to say about weather and about Boston: "Down here we have had the worst weather in recorded history. Either blistering heat or cold rainy weather. Every weekend, my sons have oodles of friends who don't care whether it rains or shines so long as they can sack in to my beach house and get out of the ghetto (as they call Boston). You wouldn't know the place any more and I never go there. Don't know my way around now. When we were in Tech, the city had a 10-story limit on houses or office buildings. Now the sky is the limit. And it looks like Chicago on the waterfront. Atlantic Avenue is undergoing a complete renovation and eventually will be a beauty spot with apartments, etc."

In August, Hurricane Camille caused staggering damage and 1916's concern was for **Marcel Gillis** in Waveland, Miss., and for Sylvia and **Vert Young** and their timberland plantation in Bogalusa, La., just across the lower Mississippi-Louisiana boundary line. In reply to our inquiry to Vert on how they survived Camille, we have a most graphic account from them, written eight days after the hurricane and which can best be conveyed to you in their own words: "We had plenty of warning that Camille was headed our way but there was little that we could do about it other than to lay in a supply of candles and a couple of flashlights, fill containers with water, and board up the picture window in the dining room. The wind began to rise about 11:00 p.m. Sunday night, August 17, and by midnight [tree] limbs and tops began to fall. We had a couple with three children as unexpected house guests, and shortly after 12:00 o'clock, I herded them downstairs into the living room and study, where we spent the rest of the night. The first tree fell across the house about 12:20, another leaned against it, three more fell across the roof in two places and a top hit the roof of our bedroom, butt end down, and punctured slates and roof deck. The rain was not too heavy and we caught most of the water in buckets, so suffered but little water damage. I had moved my new pick-up truck out of the garage to make way for the guests' car and two trees fell athwart the cab and hood. Another hit the roof of the pool bath house. Two more smashed the screened pen where I kept the new Springer Spaniel puppy. I had put him in the laundry room, otherwise he would have been a goner. The same tree smashed the table with a micarta top, beneath which I had a shelf for the two yard cats to sleep on in rainy weather. I thought we would find a couple of dead cats, and maybe they did lose seven or eight of their nine lives, but both survived, hale and hearty. Damage is widespread throughout our section of Bogalusa but no one was killed or injured.

"Broken and uprooted trees are everywhere. We must have lost 100 to 150 around the house, pool and lake. Have not attempted to make a count as our main concern was to get trees off the house, get rid of some of the dangerous leaning trees and clear the road into the place—also to get the holes in the roof covered, which we succeeded in doing by 6:00 p.m. Monday, with more durable temporary repairs on Wednesday. Power was restored about 4:00 p.m. Thursday. The heat had been terrific and, spoiled as we were by air conditioning, it was one of the least pleasant aspects of the affair. Monday afternoon an angel named Eva Mae Parlour brought us some ice cubes and later that afternoon she and a friend brought us 50 lbs. of ice. About half of the food in the deep freeze was lost—all minor tragedies compared with what happened to those on the Gulf Coast where 20 feet of water in addition to the high winds took possibly 250 lives and did incalculable damage. We were indeed fortunate in Bogalusa.

"We have had two power saws going and have saw-logs and pulpwood all over the place, especially around the house—and thus far have not been able to get anyone to haul it away to the mills. The camellia bushes mostly escaped but the azaleas and wild azaleas took a terrible beating. We were evidently in the outer edge of the hurricane. At the start of the blow, the wind came from the northeast, then veered from the north and finally northwest as the eye passed. Most of the trees fell pointing to the southeast. The rock house [Vert is a mighty rock-hound—Sec.] escaped damage except for a small puncture in the aluminum roof from a small limb. The top of a big tree barely brushed one corner but did no damage. A direct hit would really have created a shambles. Again, we are grateful! House and truck are covered by insurance. This was the worst hurricane in the known history of Louisiana, Betsy not excepted. The barometer dropped to 26.6 and winds were clocked up to 180 miles per hour. The towns of Poplarville and Picayune east of us in Mississippi suffered more severe damage than we did. Franklinton was practically untouched. The tung groves in Mississippi are almost a total loss—nuts and trees as well. The same with the pecan groves. The company's timber stands in Mississippi took a beating but those west of Bogalusa, in Washington parish, seemed to have escaped with less damage. It will take a long time to clear up the debris and fallen trees but everyone is hard at work—and thankful to be alive and unhurt. Thanks again for your concern."

Another 1916 honor—congratulations to **Willard Brown**! Here are excerpts from an August 28 release of *Illuminating News*, the official magazine of the Illuminating Engineering Society, with headquarters in New York: "Willard C. Brown, a resident of Santa Barbara, California, and a former executive of the General Electric Co., Cleveland, Ohio, today received the Distinguished Service Award of the Illuminating Engineering Society at a luncheon in conjunction with the National Technical Conference held in Boston, Mass. Mr. Brown holds the Society's highest award, the I.E.S. Gold Medal, and is a Fellow and past President of the Society. He is also the author of numerous papers on the subject of illumination. Prior to his retirement in 1960, Mr. Brown was affiliated with General Electric Co., Cleveland, as Manager of Lighting Education. He is a licensed Professional Engineer in the State of Ohio and a past President of the Cleveland Engineering Society. The 10,000-member Illuminating Engineering Society is the recognized professional authority for lighting standards in the United States and Canada."

We have word from **Blythe Stason** that he has changed his base of operations from Vanderbilt Law School in Nashville to the University of Michigan Law School where he is now listed as Dean and Professor Emeritus University of Michigan Law School. But let him tell the story: "I have enjoyed five wonderful years teaching law as the Frank C. Rand Professor of

Law at Vanderbilt, but now as of age 78 I am returning permanently to my long time home in Ann Arbor. The fact that I had a coronary attack last April precipitated the change. I shall not be entirely idle. The Michigan Historical Collections has asked me to organize my rather extensive files for permanent deposit in the Michigan Archives, and that I shall do. Also I have been asked to write a history and evaluation of the Fermi reactor, the fast breeder which has been constructed by the Bower Reactor Development Company on the shores of Lake Erie about 40 miles from Detroit." Blythe says that these two projects will fill in the next two or three years, and "beyond that I make no plans—too many things may happen." You may recall that Blythe graduated in electrical engineering, Course VI, at Tech but that years later and for years he was Dean of the Law School at Michigan! We trust he will now take things easy so that his immense experience and wisdom can be drawn on for years to come.

In mid-August **Jap Carr** wrote from Buck Hill Falls, Pa., that he and Hildegard are agreeing with the couple reported by Lee Jones in the June issue of the *Review*: "From now on, no more driving to and from Florida." Jap said that in May they planned a leisurely trip from Miami Beach back north but had to call for help in Savannah. Their son flew up from West Palm Beach, drove them back down to home in Palm Beach where Jap went into the hospital for rest and observation.

A week later he had a coronary and spent six and a half weeks more in the hospital. Wrote Jap: "Back at Buck Hill Falls now but still pretty weak, so there goes my summer tennis. Next October we'll fly down and our son will fly north to drive our loaded car down. We had to cancel a big 50th anniversary party scheduled here for July 18 but, God willing, will have it next July." While back in Florida: "Saw Don and Eleanor Webster and Bill and Helen Leach in Florida—talked with Cy Guething on the telephone but we couldn't get together." Jap adds: "Our son adopted a son almost a year ago so I am a grandfather for the third time." We all hope that Jap will really take it easy now, stop lifting the tennis racquet to see how it feels and climb back steadily on the road to good recovery.

In Jupiter, Fla., **Charles Paugh** reports that in retirement he is devoting his time to Boy Scouts, church and civic affairs.

**Kem Dean** in Houston says that except for a few short trips by car, he and Ada have not done anything special this summer. "We did spend a while in a rented cottage at a place called Jamaica Beach on Galveston Island where it is several degrees cooler than Houston and the nights are delightful with a good breeze from the Gulf. Our two oldest grandchildren, one a boy and the other a girl, will be at the University of Texas this coming school year. Two younger boys will be at Sewanee Military Academy and

the remaining two will be in local schools. Had a letter from one of our daughters in Shreveport, saying that Art Shuey will remarry soon. You may already have the particulars from him direct. Anyway, more power to him!" Yes, we had heard earlier in August from Vert Young that **Art [Shuey]** was about to marry in September. We will expect a report from him but in the meantime we congratulate him and, with Sylvia and Vert, wish the bride-to-be all the happiness that we know is in store for her. Vert notes: "If at all possible, we will make the wedding, providing we are invited. Art generally stops by Bogalusa two or three times a year on his way to or from Huntsville, Ala., where he has a son who is a scientist with the Space Agency."

**Buck Bucknam** of Auburn, Calif., is reminded of the colorful happenings at our 50th reunion three years ago: "The other day I was at a neighbor's, Dr. Peck, who wrote *All About Men*, and a friend of his was visiting him from Utah or Montana. This friend was at Tech in June 1966 to see his son graduate and recalled our distinctive red jackets. We live in a small world! I expect to see you at the 55th reunion in 1971."

We keep up a diligent correspondence with **Jack Camp** in Mexico City on the widest variety of topics, including what stories from the south and from Mexico would be appropriate for the class column, how things used to be, how things are today, and what in the world is going to happen next. If you haven't been in touch with Jack recently and want a sound engineering analysis of some current problem, just write him at Apartado 1005, Mexico 1, D.F., Mexico.

Now coming back eastward, we have a pre-summer letter from **Ted Strieby** in Millburn, N.J., who says he has little to report, that the only work he does is around the house and yard—repairs, cutting wood, care of gardens, etc. He and his wife had spent a month in California visiting grandchildren and a week in Denver seeing friends and a bit of the mountains. They planned "to spend the summer as usual in Greensboro, N.H., with other grandchildren."

Writing from home in Troy, N.Y., **John Fairfield** answers our questionnaire with spirit like this: "What done and where gone: June class reunion; Rockport, Mass; gardening; reading Thucydides; one day jaunts to New York, Vermont and Massachusetts; Tanglewood and Saratoga concerts; Rutland, Adirondack scenery and museums (N.Y.C., Blue Mountain Lake, etc.); 13 days rain in 16 days vacation. Philosophy: You remember Oliver Wendell Holmes (jurist), when asked how it felt to be 90, said he felt like he did 20 years younger, only it didn't last more than half a day." (Hm, seems to us that applies to 75 and 55!—Your Secs.) Then John adds two items for thought: "The 'salt of the earth' was probably the sales pitch of an Egyptian salt merchant." Again, "What is the younger generation going to do with all



the 'happiness' they claim to be seeking? Isn't the struggle 'happiness'? Perhaps we'd better not arrive at the 'end of the rainbow' but persevere?"

**Victor Dunbar**, formerly of Hanover, N.H., tells why he is moving to Canada:

"My son, Donald, dislikes big city life as much as I do, so he has accepted a fine offer to teach at Mt. Allison University. He has enjoyed teaching psychology at Simmons College but it meant living in, or near, Boston. He was able to drive 'home' to Hanover, only for vacations and some weekends. Mt. Allison University is located in Sackville, New Brunswick, an excellent university in an excellent town. We will be able to live together in a seven-room house in a residential neighborhood a mile from the university. Sackville is about six miles from the Nova Scotia boundary." Best wishes in your new location, Victor.

**Duke Wellington**, one of our old reliables when we ask for "a paragraph or two" has this to say. About what doing: "About all that is being done while I am at the summer home on Littlejohns Island, Maine, is to curse the weather—either foggy and rainy or hot and humid. It is one of those summers. Oh summer, where is your charm?" About What the Children and Grandchildren are Doing: "Let's not count children but how can one keep track of 21 grandchildren and 12 great-grandchildren? I think that count is right." And a bit of philosophy: "Friends of long standing are not always friends when they reach the Golden Years."

During the summer we have heard from three of our 1916 widows who have attended some of the class reunions with their husbands in years gone by. **Mrs. Robert E. (Pearl) Wilson** sends a message from Norway in August as she is "on the move again" on a 34-day North Cape Cruise on the *S. S. Brasil*. . . **Mrs. Robert A. (Hazel) Crosby** is moving from Marblehead this fall to the Pasadena area of California to be nearer her daughter and family. . . And from **Mrs. Theodore C. (Allie) Jewett** in Buffalo we have an expression of appreciation for the letters of sympathy received from sixteeners, and "Will you please thank them all for me."

We had word in August from **Charlie Lawrence** in Indianapolis where he and Lois of Kingston, Mass., were on a vacation trip visiting some of their children and grandchildren; more were to be visited in Ligonja, Pa. Says Charlie:

"Flying by jets has some warm devotees but I am not yet one of them. I like the steady *terra firma* too well to warm up enthusiastically. But it is a grand way to enlarge one's knowledge of geography, economics and people in personal ways, so will continue to fly." In a P.S. on flying, Charlie adds: "Our oldest grandson has won a certificate to fly and is now flying privately. How's that for a switch or growing up?"

And in late August from Eel Pond Point, Menauhant, East Falmouth we had word too from **Theron Curtis**: "It has been a hot muggy summer here. I keep busy around the place cutting grass, etc., and clearing out the dead-wood in the woods. We swim about every day—good exercise for the old man. Also busy with family visits—grandchildren and two great-grandchildren at the present moment. The nerves are pretty good but you know what! Rarely see anyone from 1916. We have no plans for a winter trip. We had enough last March cruising 12 islands on the *Bergensfjord*, including St. Vincents. Too many people and crowds everywhere spoil the fun. As I sit here I can look across Vineyard Sound to Chappaquidick Island. . . The sun is shining—it's a beautiful world so heck with the inflation, taxes, etc. With best regards from Theron and Hope."

**Frank Holmes** wrote in August that, after 55 years in the poultry business in the Faneuil Hall district of Boston, he expected to retire this fall. "We have been under government inspection for ten years but during the past six months the poultry division has been taken over by the meat inspectors and we have had nothing but harassment and controversy. You would think the government would try to help the small business man instead of driving him out of business. Next year Mildred and I observe our 40th wedding anniversary. Our 30th we spent in Europe and we hope to be there again next year. We have never been to Vienna or Berlin and want to see them both." Over the years they have traveled extensively. "We have been to Alaska and to Rio and Buenos Aires in this hemisphere. We have stood at the North Cape of Norway and at the tip of Cape of Good Hope in South Africa. We have cruised the South Pacific to Fiji, New Zealand and Australia and up through the islands to the Orient. Also a President Line cruise around the world in 1965." Having taken movies on all these trips, Frank expects to have "plenty to do" in retirement.

If you took Course II at Tech and your home town finds it out, you may well be called into community service. This is just what happened to **Arthur Stewart** of Willimantic, Conn., according to the May 1 issue of the *Hartford Times*: "There's more to a water pump than just letting the water through—the city's Board of Finance sharply rebuked the Water Dept. on Monday. Alleged improper maintenance of water works equipment was laid at the department's door by acting board chairman Arthur K. Stewart. The verbal blast came during a board meeting being held at the city pumping station on Rte. 195 in Mansfield to determine whether the city should bother repairing a damaged diesel pump engine at a cost set at \$7,200. Stewart was acting for board chairman Charles W. Hill Sr., who had stepped aside, commenting that Stewart, who holds an engineering degree from the Massachusetts Institute of Technology, was more knowledgeable in the matter in hand. The board had a choice—to vote either to repair the two-

year-old engine or to purchase a larger engine for \$18,000. . . . After a general look around and a thorough look at the pump engine, Stewart told Adams, "it is the opinion of this board that the engine was not properly maintained."

It is now noted (as reported by your secretary) that your assistant secretary, Peb Stone, has been using a two-headed letter head, with Jackson Heights, N.Y. at the top, but, if you turn it upside down, it then reads "Beaver Island (via U.S. Mail Boat), Lakeport, N.H. 03246" which is in the waters of Lake Winnepesaukee. And every June he lets us all know that he and Dolly are off to the island for the summer and won't be back until late September. It was the same this year.

However, this year, Frances and **Henry Shepard** decided to look into things, accepted an invitation from the Stones, made the visit, and now Henry reports the delightful experience: "I phoned them from Meredith and he came over from their Little Beaver Island with his speed boat to pick us up. They have a delightful cottage right on the water but with the luxuries of telephone and electric lights. You should see his work shop. Every kind of a tool with its own place to hang, with the tools outlined on the wall so at a glance you could pick up what was needed for the job at hand. Over the years he has developed a dock which is a pipe assembly and can be easily placed in the spring and taken out in the fall. As the water rises or drops, the height of the dock can be readily adjusted as needed. There are quite a few rocks in the boat channels so he has designed and made a clever four-sided beacon which is adjusted up and down with a crank to suit the water level. Perhaps the unit can not be patented but it surely shows the training he had in the mechanical engineering department of M.I.T."

Through **Don Webster**, we now have from a relative, further information on **Larry deLabarre** who died on July 25 after a long illness: "Before the American entry into the first World War, he joined the Harvard Unit of the American Field Service attached to the 8th Belgium Army serving at Verdun, Champagne and Jouilly and other major engagements. Following his service abroad he was associated with the Bullard Engineering Company of Bridgeport, Conn., and later with Black, Starr, Frost and Gorham of New York. He married Miss Elizabeth Chamberlain of New York who died some years ago. He is survived by two sisters, Mrs. Robert N. Cram and Mrs. deLabarre Fordyce of Quissett, Falmouth, Mass."

Don't forget our monthly joint 1916-1917 luncheons at the Chemists' Club, 52 East 41 St., New York, at noon, on the Thursday following the first Monday of each month, except July and August. If you live near New York, come regularly; if you are planning to come to New York, make it one of these luncheon Thursdays. As Peb Stone, our sender-out-of-notice



says, the more-or-less regulars include Messrs. Barker, Binger, Caldwell, Dodge, Evans, Gruber, McCarthy, Mendelson, Stern and Stone; others drop in unannounced.

In conclusion, please accept the best wishes of your class officers for a Merry Christmas and a Happy and Healthful New Year. We appreciate your prompt replies to our ever-continuing letters for news, quips and bits of well-aged philosophy. A little something from a lot of people—that's the system that seems to work out best. So, write a little but write often to your quite-willing-to-work secretaries.—**Harold F. Dodge**, Secretary, 96 Briarcliff Rd., Mountain Lakes, N.J. 07046; **Leonard Stone**, Assistant Secretary, 34-16 85th St., Jackson Heights, N.Y. 11372

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Since editing the last month's issue, the Astronauts have cleared quarantine without any Moon-germs. Since then the three have been gyrating around the good ole U.S.A. and for the record, will quote from the *New York Post* and *Times* just in case some '17ers have not read them: "Buzz Aldrin says, 'Never before in my life have I been so moved by the welcome from the bottom of your hearts that you have extended to us today.' . . . Stressed the team work that went into producing the successful Apollo mission and the sense of participation that many Americans had felt in that adventure. 'Our flight was their flight (referring to the millions of Americans who had greeted the three men in Chicago and New York during the day). We flew Eagle and Columbia with their hands helping us on the controls and their spirit behind us. There are footprints on the Moon. These footprints belong to each and everyone of you.' . . . At Buzz's home coming celebration in Montclair, N.J., "I look at the moon and I feel it is hard to believe I have been there. But I look again and I realize that I am looking from a warm and comfortable vantage point, the Earth.

"I remember that on the flight, I looked back toward the Earth, watching the panoramic beauty of it unfold before us—the colors reds, browns, and greens."

While recording the events of one of our honorary members, it seems fitting not to overlook the others, they are: Conchita Lobdell Pearson, the late Horace Ford, James Killian, Thomas Pitre, Donald Severance, and Howard Johnson. We have not been soliciting items of news from our living honorary members, however we feel it would be very appropriate if we occasionally received communications from them.

On September 11, the Lunn's had the great pleasure of entertaining **Conchita Lobdell Pearson** at dinner. Conchita was on her way home to Mexico after three months of travel. The highlight of her trip was a five-week visit to Norway as

the guest of Mr. and Mrs. Harold R. Bjerke in Oslo. The Bjerkes are wonderful hosts as Al Lunn and son Gordon will attest, having met them in Oslo in 1958. Harold is a classmate of the late Harold Pearson, '23. Many 1917 classmates will recall that shortly after Conchita and Harry were married, they flew to Spain to spend a holiday with the Bjerkes. The trip to Norway included a five-day excursion by boat to the North Cape with the ultimate destination Kirkenes near the Russian border. There were many motor trips through the Norwegian mountains and forests climaxed by visits to Helsinki, Finland and Leningrad. Conchita was thrilled to meet friends from Mexico in Leningrad.

After several weeks in Toronto she visited the Penn Brooks in Boston and her niece, Bertha Maria Zambrano from Monterey, who was working in Boston for the summer. Conchita was sorry indeed to miss our 52nd Reunion in Northfield, but extended her best to all of her 1917 classmates.

Ruth King, Associate Editor Emerita of *Technology Review*, wrote as of April 23, "Please accept my belated, but most sincere thanks for '17's share in my retirement party last February, and for the lovely gifts I received. I am sorry you were not able to be present that evening, but can well understand the limits of time and distance. During the winter I have had ample time to enjoy and admire the M.I.T. plates and the Stuben glass vase; the Polaroid camera will be an incentive for a vacation. So far I have not missed worrying about *Technology Review* deadlines after 40 years, but I do miss the association with our loyal M.I.T. Alumni."

The *Brown Alumni Monthly* of last April covered the appointment of Thomas O. Paine, '42, as head of the U.S. space program last March 5. He is the son of retired Navy Commander, **George T. Paine** now residing in Berkeley, Calif.

We have it on good authority that a few months back **Ray Stevens** received the Million Mile certificate award from United Airlines. We would be interested to know whether this is actual or computerized mileage.

Our hats are off to Mrs. **Joseph L. Calabro**, 19 Neponset Rd., Quincy, Mass.: "I am writing for Joe as he hates to write. He has worked as draftsman and architect these many years. Retired from Chas. T. Main, Inc., five years ago. We have nine children, 20 grandchildren, from whom we have frequent visits. Joe takes the boys fishing or to the ball games when he is not busy with chores, (Mr. Fix-it), or busy with his pet hobby, gardening. Last year he and I took a trip to Italy and Paris. We visited all points of interest and relatives whom we had never met and who are expecting us to return for a longer stay, which we hope may come to pass. Joe always loved architecture and am sure if he had it to do over again, would certainly choose M.I.T. If any of his classmates who remember Joe

are in our vicinity maybe they would like to get in touch."

From the *Architectural Forum* of last March: "This year's Gold Medal of the A.I.A. will go to **William Wilson Wurster**, one of the originators of the Bay Area Style and former dean (now dean emeritus) of the School of Environmental Design at the University of California in Berkeley. Wurster's rural vernacular houses of the '20s and '30s brought about changes in popular attitudes toward domestic architecture. Before becoming dean at Berkeley Wurster spent several years in the East as Dean of Architecture and Planning at M.I.T.—the first dean there who was not Beaux-Arts oriented. He is now senior partner in the firm of Wurster, Bernardi & Emmons."

**Howard L. Melvin** now in Los Altos Hills, Calif., writes as of February 1 last, "Though I travelled many miles and places while working with Ebasco Services, we are tempted to do some more with leisure until we face the task of getting ready and arranging for the care of our one and one-quarter acres and house. Also I could add that this spot in California is as about as good as one could find. It beats New Jersey having lived in Upper Montclair for 35 years. Many places are much worse so am not kicking for a minute about New Jersey-New York. My experiences and travels started in 1917 after the graduation year at M.I.T. I am glad we returned for my 50th with the rest of you fellows. Our trips this year will probably be by auto to Southern California and the desert in March, and to the Northwest in the fall."

**John Holton**, Skaneateles, N.Y.: "As for activities I still have one consulting commitment, keep busy with large ground care, and garden in the summer. Wood turning hobby in the winter and a month or six weeks in Florida west coast during February and March. With 13 grandchildren and one great-grandchild and a summer cottage on the lake here, our summers are kept busy and interesting. Have my own bass fishing pond, small but good fun. I am convinced keeping interested and active is the best prescription for a long and healthy life." John reports having enjoyed the 51st reunion at Sturbridge, Mass., but as of April was looking forward to the 52nd in a different location. The dates of October 8 and 9 at Northfield Inn should have put them in the best shape for their 50th wedding anniversary on October 11.

**Joseph Littlefield**, now a Floridian seems to have acclimated himself except for the control of the humidity. Seems that **Bill Neuberger** has taken care of this chemically, and it would seem all that is necessary is for Joe to hitch up another dehumidifier—the condensate therefrom is good for Doris's steam iron, your car batteries, Southern Comfort in case no branch water, etc. Joe further advises: "I have been helping on reorganization of the M.I.T. Club down here, and will serve as chairman of the nominating

committee. Our children are doing very well in school. Our daughter Melissa is going into the last year of Junior High next year, and has been on the honor roll. She got a minor science award last year. Josh, age 9 was just elected president of his class, so he appears to be doing well in that direction. He is in the Cub Scouts and has worked for most of the various things they work for."

**Al Lunn** has received a silver cup inscribed under the seal of the Institute "M.I.T. Corporation Visiting Committee for Political Science—John A. Lunn." The Corporation Visiting Committees serve a very valuable function.

The Alumni Seminar on Technology and Medicine saw the following in attendance: the Dennens, Rosses, Wilsons and Al Lunn.

Present at the annual meeting of the M.I.T. Club of Northern New Jersey were Ray Brooks, Ed. Aldrin, Sr. and the Proctors. Upon the arrival of Ray the president called the meeting to order remarking, "Now that Ray has arrived the meeting can get underway."

The 50th Memorial, sponsored by '17's widows, has had 41 donors. . . . One '17er on the move is **Osgood W. Holt** now at 9024 Craydon Circle, San Ramon, Calif. 94593; Phone 415-828-0441. Ossie advises "The most exciting thing that has happened to me lately is an attempt to try and get away from the smog situation of Los Angeles county by moving up north. Whether the move will be successful, remains to be proven. Our new home is a very attractive semi-retired development, called Sunny Glen off Route 680, 14 miles south of Walnut Creek. We do have an attractive Club House and recreation activities. Golf is right at the entrance, San Ramon National Golf Course a full length, 18-hole one. Do hope I will be able to resume golf relations with Howard Melvin just across the Bay at Los Altos. Sure did enjoy playing with him at the 50th Reunion at Eastward-Ho at Chatham. Unfortunately, it was not convenient for me to attend the Alumni Association meetings at Los Angeles as they were too far away for me to enjoy driving alone 50 to 60 miles on the various Freeways to attend the meetings. I have been selling real estate out of Claremont for the past six years and it is difficult to plan ahead. It will depend upon whether I decide to give up selling in a very fertile field here, whether I try to attend meetings in the San Francisco area. When I see Stan Dunning's address so frequently in letters or *Review*, it almost makes me homesick as I spent my young life living only half a mile from Stan's home and use to go to church almost directly across the street from his home. We will be only 35 miles from our married daughter's home in Saratoga and only 50 miles away from Stockton where two of our grandchildren are attending the University of the Pacific."

Other '17ers on the move are: G. Hobart Stebbins, 1515 Fairview Ave. East,

Bellevue, Wash., 98004; Rear Admiral Wm. A. Sullivan, 939 Coast Blvd., Apt. 9-E, La Jolla, Calif., 92037; and Adolphe H. Wenzell, care of Onteora Club, Tannersville, N.Y., 12485.

As of July 1, 1969 the following are assumed deceased because of mail returned to the Alumni Association: Diwan N. Chand, George I. Goodwin, Harold J. McDonald, Charles E. Richardson, and Hsi C. Wang.

Our Class of 1917 was tops at the Annual Alumni Officers' Conference, September 4 through 6 at Cambridge. Attending were the Dennens, Ray Brooks (who among many other accomplishments is also a master omelet maker), Ken Bell, Ken Lane, Ray Stevens, Stan Dunning, Al Lunn (who was celebrating a birthday on the 6th) and the Proctors. The Presidential Citation awarded to the M.I.T. Club of Mexico at the A.O.C. luncheon was accepted on the club's behalf by Bill Dennen.

The Class Activities Committee held a Class Secretaries' meeting at the time of the Alumni Officers' Conference. The subject that impressed us most is the limited number of names appearing in our notes, some repeatedly, compared with the total class roster of 247 active classmates and 71 who are considered inactive. On a guess only about 50 have been mentioned in our notes. We surely would like to see this number doubled and wouldn't you like to read of many more '17ers? Here's how! If you have not returned that Dud Bell Reunion postal card, send it now! Also when you send in your Alumni Fund contribution, use the flap on the envelope for your message, no matter how brief it may be. For the 1968-1969 year, we had 144 contributors to the Fund.

The '16-'17 monthly luncheon resumed on September 4, courtesy of the Yale Club in as much as the Chemists' Club had not completed their redecoration of the entire 2nd floor restaurant. It was a rainy day but two '16ers and three '17ers showed up: **Bill Neuberger**, who we were glad to see after an absence of 10 months visiting wineries in California; **Clarence Seely** who is helping to solve the Long Island Railroad's commuter problems; and your secretary. Luncheons will continue on Thursday following the first Monday of each month, September through June, at the Chemists' Club, 52 East 41st St., New York City.—**C. Dix Proctor**, Secretary, P.O. Box 336, Lincoln Park, N.J. 07035; **Stanley C. Dunning**, Assistant Secretary, 6 Jason St., Arlington, Mass. 08174

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I have just returned from four days on the M.I.T. campus as a participant, first in the Alumni Officers' Conference and then in the Alumni Seminar on Technology and Medicine. I wish it were possible for each of you to do likewise—not only to see how much M.I.T. has expanded

physically since 1914-1918, but also to discover the almost explosive broad spectrum of educational activities in fields unknown to us in those days of yore. Other columns of the *Technology Review* will detail better than I can, what took place in these four days.

As your representative, I owe it to you to interpret as well as I can what I sense to be the outlook of the present day student compared to ours over 50 years ago. I had a good opportunity to observe this at a two-hour session devoted to student unrest and other undergraduate problems, with a group of about 25, including faculty, students, alumni, and administration.

I sum up my observations as follows: Let's not consider at the moment the explosive issues such as the Vietnam war. Suppose back in 1916 we were taking a course on the gasoline engine. We naturally would have studied the design, the theory, the efficiency and all other facets of making a better gasoline engine. But today's student has another dimension to consider—the problem of pollution. He asks about the social and human consequences of building more gasoline engines; would it raise the quality of human life to substitute electrically driven automobiles? This consideration of the ecological and biological effects of technology can be applied to nearly every discipline at M.I.T. And so I ask you, dear classmate, to do some soul searching. Would you confine yourself today to studying the gasoline engine as we did 50 years ago, or are you concerned with the smog it produces? I believe if we take this kind of a look at our present day undergraduate, with understanding we can go a long way towards bridging the generation gap.

I would be less than candid if I failed to report that one dinner meeting devoted to nutrition was marred by a demonstration of about 30 students shouting "Stop the War" and Ho Chi Minh slogans (see *Technology Review for October/November, 1969, pp. 114*). There was no violence, but it brought home forcibly what it was intended to do—shake the alumni out of their supposed apathy in considering the Vietnam war and cause them to think about how concerned and involved the student today is with this explosive issue. I invite your comments.

Among participants in these two alumni events were Julian Howe, John Kilduff, Harry Levine and Franklin Wells. The first two live in the Boston environs, are seen frequently at M.I.T., and appear in these notes frequently.

**Harry Levine** flew in from Florida; he is busy and active in the M.I.T. Club of Florida and also spends much time advising small business concerns—a job which contributes in a very practical way to making this a better country.

It has been some time since we have had news of **Franklin Wells**. He had every intention of attending our 50th reunion—



but a heart attack intervened. He has made a good recovery, I am happy to report. It was a joy to see him active and well. During our get-together, we pieced together his story. Like most of us, he entered the Army before completing his four years at M.I.T. Upon discharge, he enrolled in the Sorbonne University where he studied aviation under Professor Marchio, receiving his degree in 1920. He then went to work for Westinghouse Air Brake Company for a year, returned to M.I.T. to get his M.E. degree—and went back to Westinghouse for ten years. Then he went to Bendix Corp., at South Bend, Ind., for a year.

In 1939, he joined American Foundry and Machine where he remained until 1941. In the meantime, U. A. Whitaker, '23, who worked under Frank at Westinghouse, took over AMP Inc., and now reversed the procedure and asked Frank to work for him. Whitaker subsequently made a gift of one of the new buildings on the M.I.T. campus. It was a happy and profitable arrangement from which Frank retired as Director of Research but still is active as a consultant for them. Among his professional society activities are the A.S.M.E., A.S.M., E.S.A., American Chemical Society, and the Optical Society of America. His family includes his wife, daughter, and one grandchild. His son died some years ago.

A most welcome installment concerning his career comes from **Bill Wyer**. I challenge all of you to go and do likewise. "Your appeal for autobiographies will bring at least one result, even though I don't agree with you that they are interesting to classmates.

"I came to M.I.T. after graduating at Yale. I had always been interested in railroads, and M.I.T. seemed the logical next step. Academically I did not learn very much at M.I.T., or at Yale either for that matter, but I did learn to budget my time. At that time we could take courses at Harvard also, so I took on the courses at the Business School there which involved railroads. I found the work at M.I.T. rather easy, and this led me into extra-curricular activities such as the tennis team, the musical clubs, the Civil Engineering Society, Osiris and the chairmanship of the Dormitory Committee, and the Finance Committee for undergraduate activities, the last two for reasons I do not now recall. I found myself with about twice the amount of school work I was allowed to carry, and with about three times the extra-curricular points I was permitted, but since in the second year of my stay at M.I.T. many other men were leaving to go into the service, nothing was ever done about it, and I was forced to learn how to handle this load.

"I had enlisted in the Engineer Reserve Corps in February, and in May, 1918 I was sent to the Officers' Training School at Camp Lee. They were short of Engineer Officers at that time, so I got my commission in ten days. (Some of my classmates got theirs in three.) I accom-

plished nothing for my country during the remainder of the war, so was discharged in time to get home for Christmas, 1918.

"By that time the government had taken over the railroads, and one of my Harvard Business School professors was in charge of a department of the Railroad Administration. I went to work for him.

"The railroads had been taken over under a standard contract which basically assured them their average earnings for the three years prior to their takeover. I wound up my administrative career by organizing a section of about 100 engineer accountants charged with the duty of determining how much the government owed each railroad. There were two schools of thought as to how this would be determined. I headed one school, and the Association of American Railroads headed another. Just before Director General, Walker D. Hines resigned to go back to private practice, he decided in our favor. Thereupon the President and general counsel of the A.A.R. wrote a long letter to the new Director General, John Barton Payne, requesting a reversal of this decision. Mr. Payne, replied, "I would not think of reversing the decision of my illustrious predecessor, especially on the basis of a seven-page memorandum." This decision saved the government several hundred million dollars, a large sum in those days.

"About the time my administrative section was organized and beginning to function, I received an offer to go to the Norfolk Southern Railroad at Norfolk, Va., as Assistant Superintendent of Transportation. I had some trouble deciding. The Interstate Commerce Commission wanted me to join them as head of a new section of Statistics and Cost Finding which they were in the process of organizing. They wrote the Civil Service specifications so that I was probably the only person in the country who could qualify. It would mean a big increase in my salary. I finally decided to stick with private industry, and have never regretted it.

"Soon after I went to Norfolk, the Norfolk Southern was threatened with bankruptcy. The government had returned the railroads to their owners on February 29, 1920, but their wages had been greatly increased while their revenues had not. So the government extended the earnings guarantee for six months after February 29 to give the Interstate Commerce Commission time to raise the rates so the railroads could survive. The Norfolk Southern had a big interest payment due on February 1, 1921, and it did not look like the I.C.C. was going to act in time to be of any help. The President of the railroad asked me to see if I could collect what was due the railroad for the so-called 'Guaranty Period.' This seemed hopeless, as voluminous data were required, and this was far from being fully prepared. Then there was the slow process of interpreting and appraising these data. The I.C.C. had not yet set up the procedures to be followed. I rushed

the N.S. data through to completion, and then unloaded my problem on my friends in Washington, with a plea for help. By intensive work over several months, we finally got an answer, and I picked up a check for over a million dollars from the Treasury Department on January 29, 1921, and the day was saved. The next Guaranty Period final settlement which the I.C.C. made with any other railroad was not made until more than two years later, although some preliminary settlements on account were made before then on account of amounts indisputably due.

"In June, 1921, the President of the Norfolk Southern, Joseph H. Young (a grandson of Brigham Young) was elected President of the Denver and Rio Grande Western R.R. and asked me to go with him to Denver, as one of his staff. We got there just after the Pueblo flood, which cost the railroad over three million dollars.

"I soon grew into a kind of operating assistant to the President. I developed a system of control of operations through information as to unit costs, which was new at that time, but which basically underlies all the modern systems of this kind, although we did not get the pertinent information to headquarters nearly as fast as computers do today.

"One of the major problems facing the Rio Grande was the construction of the so-called 'Dotsero Cutoff,' which would run from Dotsero, Colo., on the main line at the foot of the western slope of the Continental Divide, to Orestod, 42 miles up the Colorado River, to a connection with the Denver and Salt Lake, and thence into Denver. If arrangements could be made with the Denver and Salt Lake for through operation, or if the Denver and Salt Lake could be acquired, this would shorten the Rio Grande's distance from Denver and Salt Lake by 175 miles. I was assigned the job of making a detailed study of the economics of this project. After more than a year, we produced a projected income account of the effect of this project on the Rio Grande, and I recommended that it be proceeded with. The Board of Directors approved. Then followed a tremendous battle before the I.C.C. for the right to build this new line, as the Denver and Salt Lake wanted also to build it. The Rio Grande won, and this resulted in the eventual absorption of the D & SL.

"My eight years with the Rio Grande were both interesting and exciting, but the pay was low. When I once asked my boss for more money, his reply was, 'anticipation is the greatest thing in life.' Eventually the road went into bankruptcy again and he was replaced by Thomas Beacom, who had been operating Vice President of the Rock Island. He was a fine operating man, but did not have much use for my reliance on costs and statistics. We had a violent argument one day, and I left feeling sure that my career with the Rio Grande was over. I was crying on the Executive Assistant's



shoulder when the boss came out and stood glaring at me. He asked the Executive. 'How much does this man make?' He was told. 'It isn't enough. Raise him \$50.00 a month.' Real relief came later as a result of the Dotsero Cutoff hearings, where I met the Chairman of the Board of our company. He offered me a job as his assistant in New York, at double the salary. It proved to be worth it.

"Both my boys were born in Denver, and as a place to live, it was the best I have ever found. One of my boys is head of the law department of American Cyanamid, and the other is Comptroller of one of General Dynamics' subsidiaries."

My appeal for more stories resulted in this note from **Jack Purves**. Many thanks, Jack. "I read with interest your sentiments to the effect that other people's lives are exciting to listeners. Possibly you are unique, or I know the wrong people. I am chiefly aware on the part of my friends of a polite apprehension that I might sound off.

"My last paid employment was with the War Production Board. My major substance derives from a now lapsed license to Sperry Gyroscope covering the Fluxvalve, an electric coil assembly that has supplanted the magnetic needle in airplane compasses.

"We have two married daughters and seven grandchildren, the oldest of whom was exposed to Maggie Magoon at Franklin Pierce. We might get together in Boston some time this fall."

How about telling us more about your work with the War Production Board and the Fluxvalve. We all would like to know the details.

After a long illness, **Julian T. Leonard** passed away on August 15, 1968. I am grateful to Leonard Levine and Sax Fletcher who also noted the newspaper account from which we learned the following.

Julian, who was born in Middleboro, Mass., graduated from Phillips Academy, Andover, Mass., prior to attending M.I.T. During W.W. I, he served in France as a lieutenant with the 76th Division.

After joining and becoming president of Leonard and Barrows Company, Middleboro shoe manufacturers, he reenlisted in the Army Air Corps in W.W. II, serving for four years and leaving the service as a lieutenant colonel.

For many years he served as president of the Sigma Alpha Epsilon Chapter at M.I.T. He is survived by his wife, Marjorie; two sons, Julian T. and Charles E. Leonard; a daughter, Mrs. Bradley M. Braymond; and nine grandchildren. The Class extends to them its sympathy.

**Ed Rossman** underwent surgery in Portland, Maine. We understand from Dorothy the operation was successful, but the recovery is slow and painful. We all pray for a rapid return to normal good health.

New addresses include Wendell H. Kayser, 424D Cairo, Green Valley, Ariz., 85614, and Walter T. Biggar, 67 Hadley Rd., South Burlington, Vt., 05401. Please note my own new address.—**Max Seltzer**, Secretary, 60 Longwood Ave., Apt. 808, Brookline, Mass. 02146

## 19

Since our reunion in June we have heard from many of those who attended our grand get-together. At this writing Dean Webster has sent a letter to all class members, signed by Paul Sheeline, Donald Way, Wilfred Langille, Gene Smoley and Dean Webster with a list of those classmates who attended. Franklin S. Adams, Nelson A. Bond, James Holt, John Stevens, and Carl Svenson were omitted by mistake, while the list in this column of the last *Review* did not have the names of Harry Cikins, Alfred Hoffman, Rogers Johnson, Albert Reynolds and Edward Saunders. We hope the record stands corrected as of these notes. We feel the reunion was a great success and all hope we are able to get together more frequently than the scheduled five-year gatherings.

**James A. Howe**, 102 Overlook Dr., Greenwich, Conn., sent a check for M.I.T. and stated that he was unable to attend our reunion as he was at Harvard for his 55th.

Your secretary attended the Class Secretaries' meeting at M.I.T. September 4 in McCormick Hall. This meeting was well attended, lasted three hours and gave everyone some ideas for better class notes in our *Review*.

The M.I.T. Alumni Officers' Conference on September 5 and 6 was attended by Larry Riegel, Ben Bristol, Doc Flynn and Gene Smoley from our Class. The meetings gave us a better idea of what is going on at M.I.T. At the luncheon meeting September 5 certificates of appreciation were awarded to **Paul D. Sheeline** and **Dean K. Webster** for their contribution to the success of the 1969 Fund.

These meetings were followed by the Alumni Seminar September 6, 7, 8, on Technology and Medicine which was attended by your secretary.

Many notes from classmates have indicated that they would like to get together again next year at graduation and Homecoming. **Ben Bristol** says: "hope we will have another next year." . . . **Fred Hunter** says: "I never enjoyed anything so much; a marvel of management and planning but best of all the classmates—never before have I found an entire group congenial like this one, and that includes the wives. My son, Windsor H. Hunter, '51, who is an M.I.T. graduate is President of Teradyne Components, Inc." Fred adds: "The last issue of *Technology Review* was a honey. I read every article. I hope there are more like it." . . . **Art Kenison** writes "My wife and I enjoyed our 50th reunion so much that we hope for another reunion two years from now. Next June we will be at Wellesley for her 50th."

The M.I.T. memorial service for those alumni deceased between June 1, 1968 and June 1, 1969, was held at 11:15 a.m., June 16, 1969, Alumni Day. Members of the class included were the following: Harry P. Azadian, Raymond C. Baldes, Cutter P. Davis, Frederick W. Griebel, Alfred A. Johns, Carlos Krebs, Raymond G. Lafean, Edwin M. Pickop, Earle E. Richardson, Jesse Stam, Mrs. John B. Woodward.

Colonel **William H. Bassett, Jr.**, writes: "In our declining years, Helen and I are



Raymond A. St. Laurent, '21

enjoying the beautiful clean New Hampshire air." . . . Professor **Wayland S. Bailey** writes: "At present enjoying very interesting work in the nuclear division with Stone & Webster Corp., Boston. Eight grandchildren and parents all doing fine and keeping us grandparents up-to-date." . . . **Rogers B. Johnson** writes: "I am active in engineering and selling laundry machinery to commercial and hospital laundries. My son is with Dow Chemical in Midland, Mich.

**Ernest F. Perkins** is Vice-President and Director of the Melrose Co-op Bank in Melrose, Mass. He has retired from business. . . . **Pierre Blouke** writes: "Have retired from architecture and am now growing catfish, pine trees and angus cattle. Address is P.O. Box 411, Chaton, Ala., 36518."

We regret the recent announcements of the deaths of **A. Stuart Kelsey** on May 23, 1969 and **Harold G. Pratt** on May 19, 1969. Recent records show that **Mrs. Walter C. Hayden** passed away on September 11, 1967 and that **Ellwood H. Aldrich** died in December, 1965. The following are assumed deceased as all mail is returned: **Cho Pin Hsueh**, **Shao-Yu Hung** and **Chen Tan**.

**Henry A. deBonneval**, after a period of no mail received, has the following address: 43 Fifth Ave., New York, N.Y. 10036.—**Eugene R. Smoley**, Secretary, 30 School Lane, Scarsdale, N.Y. 10583. Winter address: 1111 Casuarina Rd., Delray Beach, Fla. 33444

## 20

Fall has brought welcome opportunities to consort with members of our illustrious Class. At the Alumni Officers' Conference which was attended by Lee Thomas, Al Burke and George Morgan of Beaumont, Texas, all belying their age and looking in the pink of condition, George contributed the good news that he and Lillian will certainly be among those present at the 50th.

Classmates in the vicinity of Boston had the pleasure of seeing for themselves, on TV, that **Al Burke** was very much on the ball—the tennis ball—at the tennis

matches at Longwood. Al, whose interest in tennis has never diminished, still plays a sterling game of doubles and has been lobbying for a tennis "tournament" as a feature attraction of the 50th, was very much in evidence throughout the week, not only as supervisor of communications, an important undertaking which he has assumed for many years, but also as net card judge where his dedication to the sport was constantly on view.

Shortly after the A.O.C., Chairman Ryer of the Reunion Committee held a meeting which was attended by Norrie Abbott, Perk Bugbee, Al Burke and the writer, at which plans for the great event were thoroughly evaluated. I shall not report on the meeting in detail for very likely you will have received an interim report of progress via the postman. Suffice it to say that if any of you have been inadvertently missed or have any questions about reunion plans, your faithful secretary is the one to write to for if he hasn't the answers he will know where to get them.

When Buzz Burroughs told me about that summer cruise along the Atlantic Coast I should have inquired how come that old salt of a **Dick Gee** was not among those present. Sure enough I find that Dick was one of the crew for at least a portion of the voyage. It is pleasant to know that Dick was aboard. A salute to our stalwart sailor.

Word has reached us that **George E. Dill**, of 135 College Ave., Kirkwood, Mo., died almost a year ago.

**Joe Margolis** has moved from Brookline to Boston where he has taken up residence in that fancy, new apartment building in the heart of the city at 151 Tremont St.

Speaking of Joe Margolis and his move to one of those new apartments in the city, I am reminded that at least one other classmate has done the same.

**Ken Roman** resides at one of those impressive communities of city dwellers along the Charles River, 10 Emerson Place, Boston. It would be nice to have a report from Joe and Ken.—**Harold Bugbee**, Secretary, 121 Everett Rd., Winchester, Mass. 01890

## 21

Barely 18 months remain before our one and only 50th reunion in Cambridge, June 10 through 14, 1971. It isn't too early for you and your wife to reserve these dates on your appointment calendar and to make definite plans to be present, whether or not you have ever attended one of our outstanding series of gatherings. You will both be welcome and you will both have a most enjoyable time. Don't miss this big one. Everyone who has ever been associated with the Class of '21 is invited, regardless of degree status, to assure the widest renewal of old friendships and course, club, team, fraternity, dormitory and other associations. Join '21 in 'seventy-one!

### Hail to the chief!

We know you will share your Secretary's elation at the top honor the M.I.T. Alumni Association has bestowed on the most beloved of our classmates—one who has labored unceasingly before and since our graduation to build and strengthen the bonds which now hold our group together so well. Revered by all in the Class of '21 as well as by other alumni and those in the Institute's official family who have had the good fortune to work with him, it is a particularly proud moment for us. We two met almost the day we entered M.I.T.; we worked together almost daily, including weekends and vacations, during our four years as undergraduates, and we have since carried on constant communications, together with our wives, in continuing '21 and other alumni work in the 48 years since graduation. The Institute has recognized the tremendous contributions of our Class President with a citation reading: "In grateful recognition of distinguished service to the M.I.T. Alumni Association, the 1969 Bronze Beaver is awarded to **Raymond A. St. Laurent**, '21, successively a student officer and an alumni officer for just over half a century. From General Manager of *The Tech* and of *Tech Engineering News* he moved quickly to alumni service to his class and to the Institute. Class Secretary for nearly 25 years, Class President for more than 20 years, Alumni Fund worker, Honorary Secretary, Alumni Advisory Council member and member of the Executive Committee of the Alumni Association





Members of the Class of '21 gathered at the Walker Memorial on September 5, 1969, for dinner at the 1969 Alumni Officers' Conference. Seated clockwise from left foreground: Mrs. Maxine M. Clarke; Joseph C. Morrell, class 50 year gift committee; Edouard N. Dubé, class agent; Irving D. Jakobson, class vice president and chairman 50 year committee; Mrs. S. E. Lunden; Samuel E. Lunden, member of amity fund board; Edwin T. Steffian, assistant class secretary; and Carole A. Clarke class secretary-treasurer and member of the alumni council. (Photo by Owen Franken, '69)

are some of the many ways he has helped the Massachusetts Institute of Technology and helped his class to achieve a proud history in the annals of M.I.T."

The coveted Bronze Beaver was presented by Philip H. Peters, '37, President of the Alumni Association, at the awards luncheon during the September Alumni Officers' Conference in Cambridge. Unfortunately, Helen and Ray were unable to be there. He is recuperating from his hip operation to relieve an arthritic condition. Your Secretary was delighted to accept the signal honor for Ray, returning his compliment in standing in for us when we were unable to be present in 1955. All of the '21 group phoned congratulations to Ray at his summer home, Saints' Haven, Vinalhaven, Maine 04863. He is now back at 47 Gerard St., Manchester, Conn. 06040, where your congratulatory message and words of good cheer can be addressed.

Ray has sent us a memorandum written by Theona and Al Genaske about their trip to Guatemala and Mexico. He adds: "Al and Theona stopped in to see us while we were in Center Lovell, Maine, enroute to Vinalhaven. They own and operate 'Farrington,' a beautiful spot on Lake Kezar which can accommodate 90 guests. Becky and Elmer Campbell also called on us in Lovell."

#### No generation gap

Congratulations to three generations, all M.I.T., Thomas H. Derby, Course I, Class

of '21; Thomas H. Derby, Jr., Course VII, Class of '43, and Thomas H. Derby, 3d, Class of '69! Although not the first '21 grandson to be graduated from the Institute, this is the first father-son-grandson "team" on our records. Our Tom is head of the department of mechanical drawing at Lawrence (Mass.) High School; Tom, Jr., is international production manager of films, Food Machinery and Chemicals Corp., Philadelphia, Pa., and Tom, 3d, notes his home in Bryn Mawr, Pa. Michael P. Sutherland, M.I.T. '66, grandson of our **Edward S. Dennison**, is the first '21 grandson we know to have attended the Institute. Brian R. Pearce, '66, is a grand-nephew of **Fred M. Rowell**, '21, and John L. Marshall, '67, is a grand-nephew of Colonel **Harold O. Bixby**, '21. We'll be glad to add to our records if you will tell us we overlooked the "grand" in your family.

We are indebted to Class Agent **Edouard N. Dubé** for news of the Derby triumvirate. Ed also says he has moved his Boston consulting engineering offices to 44 Bromfield St., Boston, Mass. 02108. He is in semi-retirement but still carries on his structural engineering and construction practice a few days each week. Maïda has not been well and we missed seeing her at the September Officers' Conference. The Dubés live at 216 Woburn St., Reading, Mass. 01867.

#### Stimulating conferences and seminars

Something new and welcome was added to the annual Alumni Officers' Confer-

ence last September in the form of an afternoon, preceding the conference, devoted entirely to the work of class secretaries. Your Secretary was invited to present a paper on the collection and preparation of class news. Assistant Secretary Sumner Hayward also attended the meeting.

Registered for the A.O.C. were Maxine and Cac Clarke, Ed Dubé, George Chutter, Sumner Hayward, Irv Jakobson, Ace Rood, Leila and Sam Lunden, Joe Morrell, Ted Steffian and Joe Wenick. Leila and Sam, and Joe Morrell also registered for the Alumni Seminar which followed the conference. Alumni officers were given in-depth views of "Changing Roles in the Institute" and "M.I.T. in 1969," which left us with the impression that, although M.I.T. is experiencing the same upheavals as other campuses, it has made wise decisions to date to avoid disruption and conflict and it is taking forward steps toward fair and temperate solutions of the problems it faces. Conferences continue at all levels on the campus as intelligent substitutes for confrontation.

Writing from his home, 90 Bryant Ave., Dorset 5B, White Plains, N.Y. 10605, **Joseph C. Morrell** tells us, in part: "The '21 registration for the Alumni Seminar on 'Technology and Medicine' remained the same as reported to you before you left Cambridge last week, namely Leila and Sam Lunden and me. As expected, the seminar was most informative and interesting. I would judge there were more than 300 in attendance." Thanks, Joe.

#### Kinetics and statics

Madeline and **Ralph M. Shaw, Jr.**, 608 Riverbank, Beverly, N.J. 08010, were welcome visitors to our Brielle home during their brief stay in nearby Spring Lake. Rufe is one of the most faithful correspondents and a generous supplier of stamps from everywhere he visits. Referring to the '21 news in the July/August Review, he writes: "They brought up a flock of memories. A group of us in Course VI-A created a club, the 'Knight Rounders.' President and chief organizer was Ralph H. Gilbert, '19; Ralph Wetsten was treasurer and Herb Nock, secretary. Yours truly was just plain member. We took in Royal Wood, George Chutter and Ed Chilcott. The theme song was 'Silent Night' with a new set of words and we were very fraternalistic. I recall Herb roomed with the late James B. Smith from Taunton.

"Not having had a vacation, I recently loaded the car and Madeline and I set out for Nova Scotia. We stayed overnight in Waltham. I thought I knew the place but couldn't find the watch factory and ended up in Harvard Sq. We went north on Interstate 95, the old Newburyport Turnpike, and I stopped at Newburyport to look up Herb, whom I have not seen since graduation. His name was not in the phone book; the folks at city hall and the fire house had never heard of him. I assumed he was dead but your



class notes say that Dug Jackson saw him in Florida. Please give me his address. [Herbert K. Nock, Apt. 604, 710 N. Ocean Blvd., Pompano Beach, Fla. 33062—Cac.] We couldn't get the Bar Harbor ferry and decided to take the one from St. John, N.B. We stopped at the best motel in Calais, Maine, which was none too good. That night, Madeline became ill. We junked the trip and headed home. I would have flown but Calais has no airport. The Sea of Tranquility on the moon is a metropolis compared to Calais. Madeline is getting well rapidly. We are heading for Iran in September. Regards to your charming wife."

A September letter, written at sea aboard the Italian Line's *Raffaello* and filled with stamps before being mailed at Funchal, reports both Rufe and Madeline enjoying the start of the trip in good weather on a calm sea. . . . Speaking of the Jacksons, Maxine and your Secretary followed their plan and completed the second observance of our 40th anniversary this past summer in Brielle with our own family present. Eleanor and Joe and their daughter, Molly, came here from Grand Rapids, Mich., and Alfred and Marie, with little Margee and Sallie, traveled from Glen Ridge, N.J. We all had a grand time and avoided the cold and road hazards of the actual date last December.

**S. Paul Johnston**, director of the National Air and Space Museum of the Smithsonian Institution, Washington, made news earlier this year in the acceptance of historical material for the preparation of a permanent exhibit to memorialize the Woman Air Force Service Pilot (WASP) group of World War II. Paul's museum has just been honored as the recipient of the first piece of lunar material to be put on public display, a two-pound moon rock from the batch collected by Apollo 11 astronauts Neil Armstrong and Edwin E. Aldrin, Jr., '63, and M.I.T. followed close behind with its September "Moon Show."

We have shared with Ray St. Laurent the saga of the trip to Europe and Africa by Marge and **Jackson W. Kendall**, 401 Hermosa Pl., South Pasadena, Calif. 91030, as detailed in several letters and cards with generous external use of new stamps and enclosures of complete sets. They extended the tour outlined in the July/August notes to include the steamer trip down the Rhine from Basel to Rotterdam and then returned directly to Los Angeles by air. Among the top sights was a spot high in the Dolomites.

We appreciate Jack's efforts to obtain a photo of Elizabeth and **John Barriger** seated next to them when the Kendalls were guests at John's dinner party in Los Angeles during his annual trek across the U.S. this year in the interest of his Katy Railroad.

Betty and **Dugald C. Jackson, Jr.**, Tetra-stremma, Harmony Hills RFD 2, Havre de Grace, Md. 21078, spent two months in

Scandinavia last summer. A message from Betty, with a gorgeous picture of their vessel negotiating a majestic fjord near Oslo, says, in part: "We are on the ferry riding up this fjord and you can get some idea what a thrilling experience we are having on this trip. Norway is magnificent; Sweden, Finland and Denmark also have lovely country, much of it reminiscent of New England—lakes amid the evergreen and birch tree forests and the rocky shores of the Atlantic with a profusion of wild flowers similar to ours but about double in size and more vivid in color. The picturesque old buildings in the restoration parks would inspire Maxine to fill your luggage with sketches for paintings she would want to make. We have taken many pictures and bought post cards to share the trip with others interested in seeing what we have enjoyed."

It seems the Jacksons are still celebrating their 50th anniversary year, which was enjoyed with friends from Maine to Florida and included a special gathering of their own family, totaling 23, with all three sons and daughter, their respective wives and husband and the 13 grandchildren. Betty and Dug haven't spent much time this year at "The Barnacle," their cottage in Yarmouth, Maine, whence they did go to New Brunswick to see the reversing falls at St. John, the "bore" at Moncton and through the world's longest covered wood bridge at Hartland on the return trip via the satellite radio station at Andover, Maine.

#### First class mail

**Lester F. Rhodes** gives a new retirement home address at 430 Estado Way, Novato, Calif. 94947. A graduate of the U.S. Military Academy, Colonel Rhodes had previously been professor of military science and tactics at Clarkson College of Technology and district engineer, U.S. Corps of Engineers, in charge of the office at Sacramento, Calif. . . . **Robert F. Miller**, Class Photo-Historian, says his new retirement address is Apt. 2C, Rossmoor Bldg. 50, 3386 Chiswick Ct., Silver Spring, Md. 20906. In April, May and June and also from mid-September through October, he and Helen will enjoy their comfortable home on Cape Cod, where the mail address is West Chatham, Mass. 02669. Bob says he is serving as a consultant for the Post Office Department and that he occasionally has a golf game with George A. Chutter "on that sporty course George plays in East Dennis, Mass."

#### A novel dedication

Actor and novelist Arthur I. Mayer, who lives near us in Toms River, N.J., is the author of a recently published popular historic novel having for its background the settlement of Cincinnati and the Ohio Valley in the 1790s. To us, the more interesting and unusual feature of the book is its dedication: "To Oliver L. Bardes." Both the author and **Ollie Bardes** were born in Cincinnati and both went to Hughes High School there, where Mr. Mayer's father was principal. Our own library has books by members of the

Class of '21 but this is the first dedicated to a member of the Class. An unusual honor, Ollie, but a well-deserved one. **George A. Chutter**, 50th Reunion Chairman, reminds us that he can still supply the attractive high-quality note paper which he had specially prepared for members of the Class. A sample quantity was mailed to everyone. If you have used it and want more address your request to George via Box 305, East Dennis, Mass. 02641

**Samuel E. Lunden** is a member of the Amity Fund board as the Fund enters its 30th year in support of students—extra-curricular activities, housing and others concerning students—for that is what M.I.T. is about. You have read in last month's news of the stellar performance chalked up by '21; no doubt you now have letters from Ray St. Laurent, Irv Jakobson, Ed Farrand and Ed Dubé with additional details. Two items, 50 years apart, catch our interest. The first reports on the mass meeting of the Classes of '20, '21, '22 and '23 in Walker on November 10, 1919, to promote undergraduate participation in the drive to match the then last \$4 million from the "Mysterious Mr. Smith" for endowment. Some 2,300 students gave \$118,247, including three-quarters of the Class of '21, whose gift totaled \$32,068 or \$58 per man—whopping figures for the 1919 economy! The second item is a timely and revealing article, "The Changing Character of MIT," by Professor John S. Saloma, '56, written for *Technique* 1969, which you should read in its entirety (see *Technology Review* for October/November, 1969, pp. 115-117). Excerpts: "MIT is much closer to the heavenly university-city of the future than it is to 'Boston Tech' of 1861-1916. . . . The current MIT student generation shares the radical questioning spirit of youth everywhere. The older MIT community, and especially the alumni, should not mistake this new spirit for a destructive revolutionary force. . . . MIT's student radicalism (and reaction) has to date been very much an MIT thing, nonviolent yet dramatic in its tactics. . . . MIT students have throughout the years enjoyed far more discretion in handling their own affairs and participating in the shaping of the Institute than have students at most educational institutions. . . . Other striking changes are shaping MIT besides the revolution of generations. Perhaps the most significant is MIT's emergence among the key elite educational and recruitment institutions for the post-industrial society. . . . As science and technology have become central facts of our society, MIT has moved from a peripheral to a central position controlling many of the most important opportunities for entrance into the elite positions of the future. . . . Its alumni . . . will feel these changes more gradually although they cannot escape them." Pointing out that, for medical purposes, M.I.T. is today a community of 18,000, Professor Saloma concludes: "This then is the MIT of 1969 as one alumnus sees it: At the threshold of



Attending an M.I.T. reunion in Buenos Aires during Christmas, 1968, are (left to right): Mrs. Madge Preloran, Mrs. Carmelita Igartua, Mrs. Ida Ottonello, Roberto J. Ottonello, '22, Luriano A. Preloran, '22, and Luis A. Igartua, '23.

a new era; reluctant to call itself a university of the past, predestined to be a new university of the future, perhaps the archetypal institution of the coming age; struggling to find unity in a world of increasing diversity and possibility; questioning the meaning of its commitment to public service if not its credentials for almost certain leadership. It is a time to put aside fear and to learn in humility from each other about ourselves, our past, and our present. It is a time to be proud to be sons of MIT."

#### Helpful Hospitable Haywards

Both Betty and Assistant Secretary **Sumner Hayward** continue their regular contributions to support these columns. Sumner joined us for the Officers' Conference trip to Cambridge in September and we were guests for a delightful dinner at the Hayward home, Ridgewood, N.J., on our return. The Haywards spent several weeks at Nantucket last summer and a similar period at the Appalachian Mountain Club camp on Lake Winnepesaukee, where they met old Glen Ridge neighbors of ours as well as Peb Stone, Assistant Secretary of the Class of '16. Sumner has been elected president of the Ridgewood Blood Donors Association for the coming year.

A card from Anne and **Wallace T. Adams**, 2606 Fleming Rd., Middletown, Ohio 45042, says they are enjoying their stay at Camp Muskingum, near Carrollton, Ohio. We have a long letter from Wally which we'll run next month. . . . More stamps from **Saul M. Silverstein**, chairman of Rogers Corp., Rogers, Conn. 06263. Thanks, Saul! . . . Three former members of the staff of Bell Laboratories are reported to have retired. **Wolfe W. Brown** makes his home at 114 Wellington Ave., Short Hills, N.J. 07078. **Norman Insley** lives at 36 Old Middletown Rd., Nanuet, N.Y. 10954. **Egbert W. Olcott** has a country estate at 56 Springtown Rd., RD 1, Long Valley, N.J. 07853. All are life members of the Frank B. Jewett (M.I.T. '03) Chapter of the Telephone Pioneers of America.

#### For the Holidays

Sincere thanks for your splendid support of M.I.T. and class activities, which we hope you will continue. It is our intention to surprise you with an up-to-date direc-

tory of the entire membership of the Class of '21 in time for you to correspond with old friends and close associates of our undergraduate days so as to arrange for meeting them at our 50th reunion in 1971. A note from you to your secretaries right now will greatly aid the directory preparation, so please write us promptly. The Season's Greetings to you and your family from your '21 officers and committee chairmen.—**Carole A. Clarke**, Secretary, 608 Union Lane, Brielle, N.J. 08730; **Edwin T. Steffian**, Assistant Secretary, Steffian, Steffian and Bradley, Inc., 19 Temple Place, Boston, Mass. 02111; **Sumner Hayward**, Assistant Secretary, 224 Richards Road, Ridgewood, N.J. 07450

## 22

As they say about the income tax "it's better to give than to deceive." Your secretary is giving a few notes prior to boarding the *Queen Elizabeth II* for a business and pleasure trip calling on classmates in England and Scotland. Bottles will be thrown overboard daily containing class notes for use as they wash ashore at Revere Beach. Madeline and **Parke Appel** have promised to float news down the Danube as they cruise from Vienna to Budapest—also in September. Parke has written a class letter regarding our 50th reunion on campus in June 1972. In order that we be, as usual, outstanding and commendable Alumni, he suggests that a generous gift be forwarded during the interval.

A complimentary newspaper clipping indicates that **Frank Westcott** of North Attleboro is Mr. Bridge in New England and perhaps the nation. Not only does Frank have more Master points than any other player in New England but also has more accolades on his record for working for bridge and participation in the furthering of this game throughout the United States. As almost a charter member of the American Contract Bridge League, Frank has fostered every good thing that has come along in competitive bridge for many years. It's only fitting then that he preserved his championship accomplishments (as he does so often in major tournaments) by winning with Steve Ekblad of Connecticut as his partner.

Ray Brooks, '17, of Summit, N.J., has forwarded a clipping regarding the retirement of **Howard M. Spooner**, underground design and operation engineer for the Public Service Electric and Gas Co. of Newark. Howard has completed more than 43 years of service having been involved in the construction of the first 138,000-volt underground cable on the Public Service system in 1936. He has actively participated in many aspects of underground systems including the establishment of design and operating standards for low voltage networks. Howard and his wife have two children and five grandchildren.

Special mention should be made of **Norman Joy Greene**, Governor General of the General Society of Mayflower Descendants. He has moved from Berwyn to 507 Newtown Towers, 3400 West Chester Pike, Newtown Square, Pa.

**Robert C. Warren** has recently completed a project assignment overseas for the International Executives Service Corps. We understand that he has retired as Board Chairman of Arkansas Frozen Foods, Inc., but left his comfortable St. Petersburg home to accept a five months' project assignment on the Council for International Economic Cooperation and Development at Taipei, Taiwan (Government Development Group). In operation since January, 1965, I.E.S.C. has approved assistance for systems from over 1,470 enterprises in 44 countries of Latin America, the Middle East, Africa, South and East Asia. Its volunteer executives with their knowledge of modern managerial practices have helped businesses of all kinds and sizes.

**Harold D. Stanley** has retired and is permanently located in Florida. In between cutting a lot of grass he is doing a little consulting work on lead-acid batteries.

**Henry M. Schley** of Jacksonville, Fla., enjoyed a visit from Janet and Ted Miller in the past year. He has retired for the second time but is busier than ever doing consulting work.

A large central picture in the *Boston Evening Globe*, of July 8, shows **William B. Elmer** posting his "95 Theses" on the door at headquarters of the Unitarian



Universalist Association on Beacon Street, following the lead of Martin Luther in 1517 in similar challenges. Bill Elmer's "95 Theses" runs 26 mimeographed pages, double-spaced. He offers copies to any of our Class. Bill is called a modern person, and has described himself as "an educated blacksmith."

Your Secretary dictated the above and now *his* secretary, with faint heart, continues while he is in England admiring the tranquil countryside, in Scotland learning the sword dance, and skirling his bagpipes with the Ferguson tartan flying in the breeze. While he visits the regions peopled by the shades of Tam O'Shanter and Richard Coeur de Lion, we will keep the home fires burning brightly. To boast of his latest activity—he will appear in Miami at the National Electrical Contractors Association to accept the honor of being made a Fellow of the Academy of Electrical Contracting. He will probably be wearing the medal at your next Alumni meeting, so be sure to notice it!

The sympathy of the Class goes to the families of **Henry W. Coughlin** of Southampton, N.Y., and **Samuel Sokolsky** for whom services were held in July. Mr. Sokolsky was president of the Cantor Insurance Agency; he had been in the insurance business for 30 years and was active in the Jewish Big Brother Association. He was affiliated with many charitable and philanthropic organizations.

Among the changes of address are: Charles C. Fulton, Osprey, Fla. 33559; Charles S. Comey, Sun City, Ariz. 85351; Thomas H. Stubbs, Ormond Beach, Fla. 32074; George C. Taylor, San Diego, Calif. 92109; Dr. Edwin J. Purcell, Oracle, Ariz. 85623; Harry E. Rockefeller, Bronxville, N.Y. 10708; Louis H. Hobbs, Newport, R.I. 02840; Donald B. Marsh, Dennis, Maine; and Edward C. Fales, Salisbury, N.H. 03268.

So, if he doesn't find himself in possession of an ancient old Scottish castle and keep, your secretary will be back to guide the January class notes into print with his capable hands.—**Whitworth Ferguson**, Secretary, 333 Ellicott St., Buffalo, N.Y. 14203; **Oscar Horovitz**, Assistant Secretary, 45 Gerard St., Boston, Mass.

## 23

Five of your class officers attended the Alumni Officers' Conference at the Institute on September 5th and 6th: President Howard Russell; Vice President George Johnson; Class Agent, Herb Hayden; 50th Year Gifts Chairman, Dave Skinner and yours truly. We all heard a good deal about the changes in curriculum, what it's like now at the Institute and a very capable history of some two years of student unrest and the steps taken to understand and cope with it. Personally we felt that it was the best A.O.C. that we had attended even considering the controversial nature of the many discussions. We felt also (please understand the use of the editorial "we") that things are going surprisingly well considering the many, many problems that have arisen lately in this era of change. Many different shades of opinion were expressed in our own group but before we left we thought that the conference was productive of much better understanding all around.

Horatio Bond attended a short meeting of those class officers present and duly audited the interim report of the treasurer. We have nearly \$3,000 in the bank with all bills paid and are in good shape to plan ahead for the 50th reunion in 1973 and its obligations.

Your Secretary-Treasurer attended the workshop for class secretaries on September 4. Problems of getting material for class notes were discussed at length. Stressed strongly was the need to know more about what classmates are thinking, particularly in terms of the changing policies and programs at the Institute. And so my friends, let us have your thoughts, and, provided these are constructive and newsworthy we shall organize these and send them in for publication in these columns. We will shortly send out a letter asking for your ideas about where to hold the 50th reunion—completely or partially in Cambridge.

Alumni Day attracted a goodly number of our classmates: Alan R. Allen, Horatio L. and Mrs. Bond, Robert T. and Mrs. Colburn, James H. and Mrs. Evans, Hugh S. and Mrs. Ferguson, Richard H. Frazier, Cecil H. and Mrs. Green, E. Louis and

Mrs. Greenblatt, Elliot P. and Mrs. Knight, Howard A. and Mrs. Lockhart, Charles E. Mongan, Jr., Paul R. and Mrs. Plant, Howard F. and Mrs. Russell, David W. and Mrs. Skinner, George A. Johnson and Royal and Mrs. Sterling.

In the news we see a number of items. We particularly value the contributions to our column from Carole A. Clarke, '21, who sent us the notice of the Annual Meeting of the M.I.T. Club of Northern New Jersey which featured the talk by our notable classmate **Julius Stratton** on "The Ocean and National Priorities." We have reported previously the excellent work that Julius is doing as chairman of the select panel that undertook the two year intensive study of the oceans and our national needs and opportunities. We also see that Julius' daughter Ann Cary Stratton became the bride of Mr. Lew Finch Boyd of Wellesley Hills, Mass., at South Newfane, Vt., the Stratton's summer home, on August 9.

**Melvin C. Molstad**, chemical engineering consultant to Davison Chemical was honored at the University of Pennsylvania on its Chemical Engineering Day in May. Melvin was recognized for "41 years of devotion to the education of young men and women in the principles of chemical engineering. During his 30-year tenure at University of Pennsylvania, nearly 900 B.S., 300 M.S., and 60 Ph.D. graduates in chemical engineering have benefited from his enthusiastic instruction."

We also see that **Arne Lier**, chief Structural Engineer, Port of New York Authority, received one of the James F. Lincoln Arc Welding Foundation Awards in 1968 for his unique method of designing supports for cast iron rapid transit tunnels during building construction.

Again our notable class members hit the news as we see by an announcement from the American Institute of Physics that **Bertram E. Warren**, Professor Emeritus of Physics at the Institute, continues in office as first vice president of the International Union of Crystallography, a post that he has held for three years.

From the College of the Holy Cross, Worcester, Mass., we learn that **Raymond**



**P. Harold** has been appointed to the Board of Associate Trustees of that institution. Harold has been chairman of the board and president of the Worcester Federal Savings and Loan Association since 1937. He attended both the Institute and Carnegie Institute of Technology; he has lectured at the International School of Savings and Loan Associations at Oxford University, England, at Columbia University School of Architecture's Institute for Urban Environment, and at the Harvard Business School. Harold received an honorary Doctor of Commercial Science degree from Holy Cross in 1960.

**Henry F. Culver** tells us that he tried living in Ft. Lauderdale, Fla., for two years. "A beautiful town and plenty to do," he said, but went back to good old Hinsdale, Ill., as of last March!! How about this, Florida classmates?

**Irving J. Kahan** writes that after more than 35 years with Sprague Electric Co., he has retired and now resides at Bal Harbour, Fla. His son is on the faculty of University of Illinois where he will continue his work toward a doctorate.

The death of **Newman W. Field** on May 11, 1969, has been reported to us. We are sorry to have no further particulars.

The following address changes have been recorded: Edward H. Burkart, 485 High Dr., Laguna Beach, Calif., 92651; E. Bartlett Cocke, Bartlett Cocke and Associates, P.O. Box 6617, San Antonio, Texas, 78209; Benjamin Cooper, Kettle Creek Rd., Weston, Mass., 06470; Joseph P. Keegan, Apt. 202, 2190 N.E. 51st Ct., Ft. Lauderdale, Fla., 33308; Harry S. Rubens, Apt. 901, 5130 Brittany Dr. So., St. Petersburg, Fla., 33715.

Please try and give us your thinking on the 50th reunion and on how you think the thinking of our younger generation can be improved!—**Thomas E. Rounds**, Secretary-Treasurer, 4 Deer Hill Dr., Danbury, Conn. 06810

## 24

To celebrate his release from the onerous duties of the class presidency, **Paul Cardinal** treated Lorene to a post-reunion Canadian safari. By plane, train, and bus they went from Glacier Park to Lake Louise to Banff to Jasper, with all manner of stops before and after. They confronted bears, mountain goats, buffalo, the lot. Actually it was part of their 40th anniversary celebration which began in June when their kids threw a big party for them, complete with several members of the original wedding party. Now it's back to work, two days a week, that is, recruiting for the International Executive Service Corps. Latest inquiry from a classmate came from **Bob Dehlendorf**. Last we heard Bob couldn't bear to leave sunny California, but now it seems he's anxious to have I.E.S.C. send him to even sunnier East Africa.

Another pair of post-reunion travellers

were **Clint** and **Allora Conway**. They evidently decided that the northern part of the country was preferable to Florida in midsummer. Not at all sure of their itinerary, except that they made it as far as Sault Ste. Marie to visit the Cowans.

We've told you previously about **Paul Tishman's** fabulous collection of African sculpture, and how selections from it have been exhibited in Paris, Jerusalem, and Los Angeles. This year it came to M.I.T. Many of you saw the exhibit on Alumni Day in June, more than 70 pieces representing many diverse cultures. It was a unique and rewarding experience.

A note from **John del Cardayre** says that after 43 years "in, of all things for an M.I.T. man, the advertising business", he retired last January. It's really not as surprising as he seems to think. There was Thomas D'Arcy Brophy, '16, Howard D. Williams, '11, James T. Chirug, '27, and Ed Battey, '23. There are many more. He was in good company. John has retired to Virginia where three 4- to 8-year-old boys certainly ought to keep him on the go. "Lucy and I do manage to leave them with a sitter the evenings the M.I.T. Club of Virginia meets." Although rank amateurs, John and your secretary used to spend many a strenuous hour on the wrestling mat long years ago. If he still remembers any of his past prowess it may help to keep those youngsters in line.

As a bit of a contrast, **Kenneth M. McDonald's** grandson, John T. Whetstone, 3d, graduated from Washington and Lee last June, magna cum laude. Although he was commissioned in the Army reserve at the same time, active duty was deferred so he could enter the Institute's Sloan School this fall. And **Howard B. Stevens** is somewhere in between: "We are grooming our grandson, age two and one-half, for the M.I.T. Class of '85!"

Also retiring last January was **Robert L. Morton, Jr.** Bob had been with Valley Electric Corp., in St. Louis for many years, possibly since graduation. At retirement he was Vice President.

**Otto C. Koppen**, Emeritus Professor of Aeronautics, has taken up residence on Cape Cod, scene of some of his early triumphs in the glider field.

**Clarence M. Chaffee, Jr.**, gives no indication that he has any idea of living the easy life. "After 34 years in U.S. Government Procurement Service in acquiring approximately 13 billion dollars worth of Lend-Lease metals and various ores and metals for the National Strategic Stockpile, I am presently employed (at age 70), in acquiring steel for such buildings as the World Trade Center in New York City, and steel for bridges and cloverleaf intersections up and down the East Coast." So if you've wondered who is to blame for all these proliferating highways, blame Clarence Chaffee, at least in part.

Two more classmates who have no intention of retiring are **Morris A. Rabkin** and

**Theodore W. Kenyon**. True, Morris was retired two years ago from RCA, after 30 years as a patent attorney, but that just meant he went into business for himself. He has been busy ever since developing his own practice. Ted Kenyon has always been his own boss. KEN-LAB of Old Lyme, Conn., (T. W. Kenyon, Prop.), specializes in gyros, especially small ones for use in stabilizing cameras and binoculars. This is a unique and fantastic development. Imagine the difficulty of a man riding over broken terrain in a tank, or bucking heavy seas on the bridge of a destroyer, trying to keep a pair of binoculars trained on some distant object. With one of Ted's gyros it can be done. "I also have a less expensive model for commercial use." So if your hands are not as steady as they once were, and you have difficulty keeping your bird glasses zeroed in on a bristle-thighed curlew, maybe you should get in touch with Ted.

**Kenneth B. (Ike) Walton**, the Squire of Brigantine, N.J., has been handed a sizeable task. The Mayor of Atlantic City has appointed him Chairman of the U.S.S. New Jersey Battleship Committee, "charged with creating a great monument of this ship when she is decommissioned." That's one advantage in being a seaside state, ready-made monuments. Just think how difficult it would be to do this with, for example, the U.S.S. *North Dakota*.

Our chief psychiatrist **Malcom H. Finley** has semi-retired, but still continues with a bit of research and writing. However, he finds plenty of time for other pursuits, notably leisurely trips. Last June he took a freighter to Vancouver (and possibly Alaska as well—we haven't heard whether or not that came off). In any event, the idea evidently took, for right now he is on his way around the world on board the freighter S.S. *President Jackson*. If things go as scheduled Mal should be home by Christmas, just in time to start planning the 1970 trips.

Sorry to end these notes by reporting the death on May 30, of **Thomas F. Bundy**. We understand that Tom was nearing retirement from E. F. Hauserman in New York, and was not looking forward to the day. At least he was spared that unwanted experience.—**Henry B. Kane**, Secretary, Box 177, Lincoln Center, Mass. 01773

## 25

It seems appropriate at this time to appeal to members of the Class for some information which can be used in this column. Many of you have not seen your names in print here for some time. Your secretary and your classmates would appreciate knowing of your activities; and those of you who have now retired should have more time to keep us informed!

**Morrough (Mike) O'Brien** continues to receive well-deserved honors. At the last election of the National Academy of En-

gineering, Mike was among those honored; he was cited for effective participation in the field of shoreline processes and coastal engineering.

A national business magazine, in its May issue, mentioned the fact that **W. Maxey Jarman** has retired as Chairman of the Board of Genesco, Inc., having reached the mandatory age. Maxey is expected to remain with them on the Board of Directors for the full seven years provided for in the company's policy. He has always been known to exercise a heavy hand in the management of Genesco and is expected to continue this role as a director and major stockholder. He has been with the company since he left M.I.T.

A publication of I.E.E.E. notes that **King E. Gould**, former director of the Telephone Studies Laboratory at Bell Telephone Laboratories, will head the new Scientific Advisory Board for Roanwell Corporation. He will lead a group of recognized authorities who are cognizant of the needs of the telephone industry. —**F. L. Foster**, Room 4-144, M.I.T., Cambridge, Mass. 02139

## 26

It's such a gorgeous Sunday morning here at Pigeon Cove that I am tempted to put off the unpleasant news till last as I usually do. However, these items all came to me while lying in a hospital bed last week recuperating from some surgery and feeling grateful as I read them that I was one of the majority of the Class still around. (To allay any concern about me—it was a hernia and good modern surgery gets you on your feet in less than 24 hours; in four days I was home on good behavior which, among other things, permits a martini before dinner and the writing of class notes.)

The morning newspaper was provided me by a friend and the first day the name of **Raymond T. Bete**, of Barnstable, caught my eye. Ray, who had retired to Barnstable on Cape Cod from Goodyear Tire and Rubber Co., in Akron, had died at age 64.

Then a clipping came through from the Alumni Office telling of the death in Washington, D.C., of **Alfred J. Pote**. Al had never attended alumni gatherings but I recall him as a very dynamic undergraduate. He had been very active in the communications field and most recently was senior vice president of Page Communications Engineers.

The third communiqué came in the form of a telephone call from Ben Margolin the night I returned from the hospital; he had read in the paper of the passing of **Al Dolben**. Several days later Eben Haskell sent me the clipping about Al who was a partner in the firm of William H. Dolben & Sons, Boston realtors. Al had helped on various reunions over the years and was chairman of our 25th.

Finally, a note on the back of an Alumni Fund envelope from Mrs. Catherine Slunder reports the death of her husband, **Charles J. Slunder**, in January 1969, of a coronary. Having reported all of this unpleasant news your secretary extends the sincere and deep sympathy of the Class of 1926 to the widows and families of these respected classmates.

For reasons already mentioned your secretary was unable to attend the Alumni Officers' Conference in early September but Eben Haskell reports that Lou Darmstadt, Tom Green, Mooney Owen, Dave Shepard and Don Dunningham were there. Sorry to have missed it.

Jim Killian sent us a copy of a congratulatory letter he had written to **Wes Hemeon** upon Wes' receipt of the Frank A. Chambers award of the Air Pollution Control Association. The citation stated in part, "The widespread public appreciation of the hazardous and damaging nature of air pollution and the concern being given to its abatement would not exist without the understanding we now have of the nature and amounts of contaminants in the air in which we live and breathe. It is questionable if any individual has contributed more than Wesley C. L. Hemeon by his efforts and by the development of instruments of a type which both experts and public can visualize and measure the pollutants present and have this understanding that is so necessary to the corrective action of the problem which faces us." Wes, the Class of '26 also salutes you for the achievements which lead to this award.

A clipping tells of the retirement of **Harry F. Howard**, administrative vice president of the Plimpton Press, Norwood, Mass., after nearly 45 years' service. We recall that at our last reunion, Harry had a house on the Cape, at Orleans, I think, and was acquiring another with retirement in mind.

Before signing off, we want to report on how the sailing season wound up for us—you will recall that we had been down the drain all season fighting to keep out of last place. Well, at the end of the season a little tinkering with the rigging plus recognition that we had been "pinching" (sailing too close to the wind) all season enabled us to work up to a close second (10 boats racing) in the Labor Day series. Therefore, we can put the boat to bed feeling that there is some hope left and we can dream all winter of what we will have to do to get started next season. Merry Christmas and Cheerio until the new year.—**George Warren Smith**, Pigeon Cove, Mass., 01966

## 27

The end of this year, **Charlton Whittier** will retire from the Glass Container division of Owens-Illinois Glass Co., where he is a consultant and had been before that manager of customer packaging services. I am indebted to Pub for a letter announcing that he plans to join "many

of our classmates in the pasture." He and his wife, Ruth, spent two days in Canaan with the **James Lyleses** in July and found them both in the best of spirits, with Jim still making wonderful progress. On the same trip, he was able to stop in on **Jim Castner** in Kennebunk, Maine. Jim retired from du Pont last January. Pub found Jim hard at work scraping and painting blinds on a lovely old house he and his wife have bought. "His wife and daughter were in Italy attending a seminar on a specialty they both are concerned with, namely, the Latin language." Pub and Ruth are looking forward to a trip to Europe next year.

There are 280 members of the National Academy of Engineering. Election to the Academy of **Nathan Cohn**, executive vice president of Leeds & Northrup, has been announced. The Academy honors those who have made important contributions to engineering theory and practice or who have demonstrated unusual accomplishments in the pioneering of new and developing fields of technology. Membership is among the highest professional distinctions that can be conferred upon an American engineer.

**Donald L. Campbell**, assistant to the vice president of the New Area Research Staff is retiring from Esso Research and Engineering Company after more than 40 years of service. He first worked for the old Standard Oil Development Co., specializing in petroleum process research and refinery design. He had served as chief process engineer and, in 1954, became deputy coordinator of petroleum process research. In 1959, he went into the New Areas Research and recently had been working on an iron ore reduction process. Mr. Campbell who makes his home in Short Hills, N.J., holds a B.S. in chemical engineering from Iowa State College and an S.M. from M.I.T. Twenty-nine U.S. patents have been awarded to him.

There are new addresses for Harriet W. Allen, Central Post Office, Box 714, Athens, Greece, and Henry W. Newell at 4950 Emelene St., Pacific Beach, Calif. All of you should read "History in Brief" on page 129 of the July issue of *Technology Review*—text and cartoons by Chick Kane, '24.—**J. S. Harris**, Secretary, Masons Island, Box 654, Mystic, Conn. 06355

## 28

In a recent letter to Jim Donovan, **René Simard** had the following to report from Ottawa, Canada: "The Simard family is growing in age of course, but sometimes I wonder about the wisdom, specially of teenagers. My oldest has finally decided to make Pam and me grandparents for the first time about the end of November. Number two is starting his fourth year of university (Toronto)—working towards an M.B.A. and number three will enter University of Western Ontario as a freshman this fall. The two little ones, Brenda (9) and Tim (8) are doing extraordinarily well



at their school—hope it will still be that way through high school and college! The older generation tries to keep up but finds the pace a bit hectic at times. Pam is well, still playing tennis and I'm not complaining since I've had no recurrence of the coronary thrombosis of four years ago. I'm still working for the federal government in the Department of Industry, Trade and Commerce and enjoying the work—hanging on until I have to retire in three years."

Also writing to Jim from Hollywood, Fla., **Roland Earle** reported that his company, Food Research, Inc., of which he is president, is about ready to market a new edible food coating. After stating that his family is well and busy, Roland gave the following account of his piscatorial prowess: "This month I finally achieved one of my secret ambitions. Helen and I piloted our sportfisherman Blue Snapper II to Bimini for the annual Bimini Native Fishing Tournament—five days of fishing where the big ones are. To show for it I have mounted on my wall a fishing rod broken in three places—it literally exploded after I brought a monstrous blue marlin (300 to 400 lbs), up to the stern, and that was the last we saw of the marlin. It is probably lucky for me that I lost it because in the excitement I had a slight touch of heat exhaustion. We had lots of activity and some smaller fish, and a consolation prize!"

We have a report (Foster-Wheeler News Release) that **Everard M. Lester**, Courses II and XV, was elected a vice president of Foster Wheeler Corporation on May 26, 1969. He will be responsible for Research Division activities at John Blizard Center, Livingston, N.J., and operations of the subsidiary companies, Atwood & Morrill Company, Salem, Mass., Forney Engineering Company, Dallas, Texas, and Fritz W. Glitsch & Sons, Inc., also in Dallas. Prior to this appointment Everard had served Foster Wheeler three years as a consultant. He was formerly director of manufacturing and assistant group executive, American Machine & Foundry Company. He has served on the International Council, Institute of Aeronautical Sciences, and is presently an associate fellow of the American Institute of Astronautics and Aeronautics.

A news release from the public relations department of E. I. du Pont de Nemours and Company, Wilmington, Del., announces the retirement of **Charles H. Topping**, Course I, special assistant to the manager of du Pont's building products division, after 27 years of outstanding service to the company. Quoting from the release, "In addition to his du Pont responsibilities, Mr. Topping serves currently in a number of building industry positions. He is treasurer and member of the board of directors of Producers' Council, a national organization of building products manufacturers. He is a member of the advisory panel on building research of the National Bureau of Standards—named to this position by the National Academy of Sciences. He is on Pennsylvania Governor Raymond Shafer's

New Cities Panel and serves as advisor on building research to the School of Architectural Engineering of Pennsylvania State University. He joined du Pont in 1942 as a civil engineer in the design division of the Engineering Department. During World War II, he was active in design of the Hanford Engineer Works and other war-time projects built by the company for the government. Following the war, he was named principal architectural and civil engineer. In 1963 he became architectural manager in the research and development section of du Pont's Development Department, where he was active in establishing the company's building products division."

Prior to joining du Pont, Chuck built railroads in Iran, oil field production facilities in Venezuela, housing in New Mexico, and designed water works in Texas. He is a Fellow of the American Society of Civil Engineers, was president of the Building Research Institute of the National Academy of Sciences from 1957 through 1959, chairman of the committee on science and the arts of Franklin Institute in 1962, and has served on a number of national committees in connection with building research.

**Merrill R. Fenske**, who has been head of the Department of Chemical Engineering at Pennsylvania State University since 1959, plans retirement after 40 years on the faculty there.

To each and all of you our best wishes for good health and a Happy Holiday Season!—**Walter J. Smith**, Secretary, 209 Waverly Street, Arlington, Mass. 02174

## 29

Favorable comments and reports are still coming in concerning our 40th reunion which will be reported to you in forthcoming issues of the *Review*.

Due to his recent illness, **Brig Allen**, our first class president, was not sure whether he would be able to attend this important reunion. Writing to Frank Mead, he had said that if he could possibly make it—physically that is—he would be there. We were so happy to see him and his wife Evelyn pull in Friday evening to join the festivities. Brig is retired after many years of association with Reliance Electric and Engineering Co., and lives in Birmingham, Mich. The Allens are planning to move to Florida sometime this fall and will possibly locate in the Orlando area. Let us wish them good luck and many years of happiness. We will keep you posted when they make their move.

During the course of our reunion activities at Wianno, suggestions were made for an interim reunion before our 45th in 1974 which sounds a long way off. It was pointed out that some classes get together annually traveling to different parts of this country or foreign ones.

In response to this suggestion, we have a definite proposal from **John D. McCaskey** to hold our 41st reunion in St. Joseph, Mo., preferably during the weekend of May 29, 1970. The reason behind his choice of location and date is that first, he is due to graduate from Missouri Western with a degree in political science and he says it would be a great honor for him to have some of his old M.I.T. classmates present with him at another commencement 41 years later; and second, that geographically St. Joseph would afford an opportunity for eastern and western classmates to meet half-way and see what the mid-West has to offer. John has assured us that regardless of the number of those who may wish to attend, a warm welcome will be awaiting them. He will also make all arrangements. Please write to me and express an opinion.

An alternate proposal comes from **Wally Gale**. Why not have a winter reunion in some part of Florida? Now that most of us are retired or semi-retired, such a plan would be welcome for a winter vacation in the sunny south where a number of '29ers have gone to live permanently.

Wally has had a colorful career, most of it at M.I.T. in various capacities: Associate Professor of Aeronautical Engineering, Director of Summer Session, Secretary of the Institute and finally, special assistant to Jim Killian for the task of raising money for M.I.T.

Currently he is semi-retired and heads Realty Investments, Inc., and as a hobby selling land in New Hampshire. He lives in Melvin Village, N.H., with his wife Joan. The Gales have two children, Tom who is teaching college in Switzerland, and Joanie who has been in the theater since graduation and is now interested in wildlife conservation.

One of the first comments that I received concerning our reunion was from **Elmer Skonberg** who says that he enjoyed being with his classmates immensely and he would have loved it even more had his wife, Ollie, been with him. Ollie had gone to Florida to be with her sister who was scheduled to have a serious operation (which proved successful).

Elmer is presently retired after a successful career in various fields. He was with Electric Motor Repair Co., of Springfield, Mass., until 1935. Then moved to Louisville, Ky., to take a position with the Mengel Company, manufacturers of bedroom furniture employing 700 people where he advanced from plant engineer to plant manager.

A few years later, he joined the Leewood Corp., of South Bend, Ind., as sales engineer and in five years he landed on top. Since most of Elmer's talents were in sales, he decided to form his own company, on the theory that if he could sell an idea or a product for others, he could do it just as well for himself. The company he formed engineered and sold paint finishing systems which proved very



successful and a few years ago, he sold his business and retired to a life of well-earned leisure and travel.

He has actively participated in M.I.T. affairs, is past president of the M.I.T. Club of Louisville and Regional Chairman of the M.I.T. Educational Council in that area.

I received a letter from **George J. Meyers, Jr.**, who was also at Wianno with his wife Barbara, telling how much they enjoyed themselves seeing old classmates again and joining in the fun-making. George has been in the management field in association with a number of firms such as: General Electric—engineering; Manning,

Maxwell & Moore, Inc.—assistant plant manager; Glenwood Range Co.—plant manager; Reading Tube Corporation—executive vice president; Nuclide Corporation—treasurer and general manager.

After accumulating such a wealth of experience, upon his return from a business trip to Africa in 1968, he organized his own company known as Management, Motivation and Economics, Co., himself as president. His firm specializes in financial planning and control also motivation. The motivation programs, he says, are produced by the Success Motivation Institute, are excellent and are sold to firms or individuals who carry the program out themselves. He claims

these programs help people to get more results with the same energy input. He is inviting his classmates or their firms, if they have any financial or motivation problems, to contact him at 214 Wyomissing Blvd., Wyomissing, Pa.

**Amasa G. Smith** with his wife Sara and charming daughter Julia were also present at the reunion. Mace has distinguished himself in the best tradition of M.I.T. men, success in his field and participation and involvement in community affairs and problems. Upon graduation from M.I.T. he accepted a position with the Chicago Bridge and Iron Co. and moved to Birmingham, Ala. Through the years, he advanced in the firm from shop superintendant to plant manager in 1947, manager of southeastern operations in 1961, vice president in 1964 and a member of the board of directors in 1965.

## Glimpses of Reunioning '29ers on M.I.T.'s Campus



He has participated in many community and civic organizations, notable among them are: Executive Committee, Birmingham Area Council Boy Scouts of America (President 1955 to 1967); Jefferson County Chapter, American Red Cross (Chairman 1961-1963); Director Y.M.C.A. of Birmingham; General Chairman, Jefferson County United Appeal for 1960; and Birmingham's 1959 "Man of the Year." He has four children and four grandchildren.

Statistically, many M.I.T. men deviate from their specialized fields and seek success elsewhere. Such is the case of **David H. Wilson** who also was present at Wianno with his wife Ethel. David states that after spending six years in W.W. II with the Army Ordnance, he received his honorable discharge with the rank of lieutenant colonel. In 1945, he started his own business, Revelation Bra Co., of which he is treasurer and general manager, manufacturers of brassieres for women. His specialty in the firm, besides administration, is designing bras and girdles. He claims that one of his difficult chores is to check the fit of these products on *live models*. We have a feeling that when these models are hired, Ethel would make sure that they are not likely to be candidates for a beauty contest. His long range plan had been to retire at age 61, but he is still working as hard as ever. He married Ethel in 1930; they have three children and seven grandchildren.

Another classmate attending the reunion was bachelor **Anthony J. Perry**. Anthony has been with the U.S. Bureau of Reclamation as a hydroelectric engineer. Though he lived in Denver, Colo., for 15 years, and has lived in Washington D.C., for the past 20 years, his assignments carried him all over the Orient, South America, Middle East and Europe. Here is a case where Anthony did not have to join the Navy to see the world. Recently retired from the Bureau, he continues to do consulting work in his field and would be glad to hear from anyone visiting Washington; his address: 4000 Massachusetts Ave., N.W. Washington, D.C.

Our genial **Roger A. Sykes** was also pre-

sent at Wianno with his wife Mary. Roger, his motto being "enjoy life, it may be later than you think," retired from the Bell Telephone Laboratories October, 1968, after serving for 39 years. Like many of our classmates who have served with distinction for the telephone company in one branch or other, Roger started with B.T.L. right after graduation and was involved in research and development until retirement. He served on many industrial, professional and government committees in his field, has 22 patents to his credit, was elected a fellow of the I.E.E.E. in 1957, published 15 technical papers, contributed to 3 books and in 1967, he received the "Distinguished Engineer" award for that year. His final contribution at Bell was the development of the Monolithic crystal filter. His hobbies include music, astronomy, photography and ham radio: call letters W3PP and W1PP.

**J. Wesley Walters** and his wife Josephine were celebrating their 40th wedding anniversary with a trip to Europe at the time of the reunion, which explains their absence from Wianno. They returned from their trip just in time to be at M.I.T. on Class Day. Wes has retired from the U.S. Corps of Engineers after 36 years of service. Though he was stationed in St. Paul, Minn., his work took him to every state in the union. Now that he is retired, he spends most of his time in St. Paul, meeting new people and solving some problems for the state by doing consulting work. Wes spends winters in Arizona and visits other parts of the U.S. and Europe. They have two children and five grandchildren, one of whom at the age of 12 attended our 35th reunion at Wianno and performed for us in a movie which some of you saw recently. She has just graduated from high school and entered college.

There will be many more reports in the next issue of the *Review*. Until then, my regards and best wishes for a Merry Christmas and a most happy and prosperous New Year.—**Karnig S. Dinjian**, Secretary, 32 Oldham Rd., Arlington, Mass. 02174; January through March: Starlight Towers Apt. 14-E, 6000 N. Ocean Blvd., Fort Lauderdale, Fla. 33308

## 30

In the opening paragraph of last month's notes I commented on the considerable amount of material at hand and the fact that I would save some of it for the next issue. This turned out to be a prudent decision since only one additional item has come in during the last month.

Among the carry-over items is a report from **Bill Perret** who is Staff Physicist at Sandia Laboratory, Albuquerque, N.M. Bill says that he works primarily on "the geophysics of what happens to the earth immediately surrounding large explosions—mostly nuclear. I've been in this field for the last 18 years and have enjoyed it all. Including such side benefits (?) as a brief stay in the Aleutians last spring. I find analysis of field data fascinating and

it keeps the theoreticians and computers honest by providing a realistic basis for their models."

The Perrets have two sons who graduated from the University of New Mexico. William Edward teaches English and Robert is currently at M.I.T. where he is a doctoral candidate in meteorology. Bill has been an Educational Counselor for 15 years and was co-founder of the M.I.T. Club of New Mexico. He mentioned the fact that Ted Alexander, who started with our Class but graduated in 1932 was also a co-founder of the New Mexico Club. Ted has been writing a history of Sandia and some phases of its activities.

**Joe Shelley**, an associate professor in the School of Architecture at City College of New York, is a member of the New York City Landmarks Preservation Commission.

**Charley Prichard** is President, Treasurer and Director of Gas Service, Inc., in Nashua, N.H., which distributes natural gas to some 14,000 customers in the Nashua, Keene and Laconia areas. Also he holds the same positions in the Manchester Electric Co. which distributes electricity to 3,000 customers in Manchester, Mass. Until recently he was President and Director of the Nantucket G. & E. Co., on Nantucket Island. The Prichards make their home in Nashua, have a vacation cottage at Nantucket Harbor and a tree farm and camp in Middleton, Mass.

They have three daughters: Joan and Linda who graduated from Wellesley and Susan who graduated from Wheaton. All three daughters are married and have a total of eight children. Joan is Program Director of the Audubon Ipswich Sanctuary in Ipswich, Mass., and teaches nature studies to grade schoolers. Susan is interested in art and is helping an architect. Linda likes to paint and runs a nursery school. Charley is a past president and currently director of the Nashua Chamber of Commerce.

**Bill Thomas** works for Chase-Shawmut Co., a subsidiary of I-T-E Imperial Corp., in Newburyport, Mass., designing electrical equipment, e.g. fuses. He is a Knight Templar and an "avid short wave radio listener."

**Greg Smith** is undoubtedly our most assiduous worker in the M.I.T. vineyard. His current activities include: member of the Corporation; Chairman of the new Advisory Committee on Institute-Wide Affairs which includes six Corporation members, six faculty members and six student members; Chairman of the Visiting Committee on Student Affairs; member of the Board of Directors of the M.I.T. Community Service Fund; Chairman, *Technology Review* Advisory Board; member of the Pounds Panel investigating relationship of the Special Labs; and member of the Alumni Council. Greg says that "with the above assignments I think I have knowledge of M.I.T. It is a great school with a great administration. I am

proud of the school. It needs and deserves the loyalty and support of alumni."

Incidentally, Greg is also our 40th Reunion Gift Chairman, which leads naturally to the next topic for discussion. In recent years the 40th reunion gifts, which are publicly announced on Alumni Day each year, have been running in excess of \$500,000, which is the nominal goal toward which we are working. As of mid-September we were only 28 per cent of the way toward that goal. Those of you who examined the 1969 Alumni Fund report may have noted that among the 10 classes graduating from 1926 to 1935 the class of 1930 ranked 10th in respect to both percent participation and amount given. By the time you read these notes the 1970 Alumni Day announcement of our Reunion Gift will be only a few months away. We hope that a respectable total will be announced on that day.

Changes of address: John M. Weaver, South 925 Napa, Spokane, Wash. 99202; John F. Guinan, 15 Wildwood Ave., Arlington, Mass., 02174.—**Gordon K. Lister**, Secretary, 530 Fifth Ave., New York, N.Y. 10036

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Writing that he retired a couple of months ago, **Carl Connable's** new address is 2819 Craycroft Rd., Tucson, Ariz. 85716. For the 33 years preceding his retirement, he made use of the things he learned at M.I.T. both in class and on *The Tech*, as an industrial advertising man—in succession as an advertising department writer (of sales bulletins and instruction manuals); advertising manager; agency account executive (on plans, copy and client contact); one-man agency operator and consultant. Carl says it's been fun and with some spare time due to arrive any time now he expects to do some writing on his own.

My face is red! Recently I erroneously reported that **John Spalding** was Vice President of the Nekoosa Port Edwards State Bank. Actually, John is Vice President, Manufacturing, of the Nekoosa Edwards Paper Company in Port Edwards, Wisconsin.

A welcome note from **John Swanton** tells us that he has been in Maine most of the summer at his place in Westport. He seems to have had a great time and was visited by all three of his married daughters and their families. Virginia (Russell) has two boys and two girls and the other two married daughters, Dorothy (Brown) and Barbara (Duffy) each have two girls. John also reports that he has kept his sons-in-law busy rebuilding his wharf.

**Herb Chandler** reports that his youngest daughter, Candy, was one of the two girls from the Baltimore area accepted for the co-educational program recently instituted at Yale. She attended Mount Holyoke last year and entered Yale as a





**Jim B. Fisk, '31**



**Candy Chandler,  
daughter of Herb  
Chandler, '31**

sophomore. Herb is an Engineering Director with the Department of Defense; Candy worked as an Apprentice Engineer at the Westinghouse Defense & Space Center during the summer.

**Gordon Brown** made the headlines again upon his election to the National Academy of Engineering Council as did **Jim Fisk** who received an honorary Doctor of Science Degree from Harvard.

A recent release by the U.S. Department of Commerce reports that **George Cohen** has published a paper describing a process for treatment of feathers and down that uses a tanning agent and water repellent and is applicable to both landfowl and waterfowl feather filling materials. Feathers treated by the process, according to the article, have increased filling power that is durable to laundering, are free from dust exceptionally clean and will not develop an odor even when wet.—**Edwin S. Worden**, Secretary, 35 Minute Man Hill, Westport, Conn. 06880

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Ed Nealand reports the receipt of more letters showing interest in an interim reunion in Spain during the summer of 1970 and is in the process of working out a possible time-table with Juan Serrallach. He will correspond individually with those who have written him as soon as more details are available and will report to the class in the January issue.

Tom Sears passed along the following interesting letter from **Joe Welch**: "As you will recall, I had been with a division of the W. R. Grace Co. for about 10 years and, when they decided nine years ago to move headquarters to South Carolina, we parted company. I spent the next few years doing consulting work and developing some commercial real estate that we owned in Framingham. We had spent quite a bit of time in Ireland while on various European trips and although neither myself or my wife have any ancestral connections there, we decided that the way of life there offered many attractions. We have spent the greater part of the

past three years there and haven't regretted it one bit. We recently bought a small stud farm near Dublin and am in the process of moving our horses and cattle into new quarters. We have five race horses in training, with a modest amount of success our first season, and are building a herd of Black Angus cattle. We look forward to expanding our horse breeding program now that we have our own stud farm. We seem to accumulate dogs wherever we go and have a number of Labrador Retrievers, one of whom is doing very well in Retriever Trials in Ireland as well as Scotland. Needless to say, we'd love to have any member of the Class look us up if they have the pleasure of visiting the Emerald Isle. We still return to Framingham a few months in the summer and hope that we can get together next summer."

**Louis E. Jones** has been appointed Assistant to the President of Hawley Products Co., a producer of preformed molded fiber products at St. Charles, Ill. Louis was most recently Coordinator of Manufacturing Systems at Bell and Howell, Chicago. He will serve Hawley Products as an internal management consultant on systems and controls which includes an expanding computer program. He and his family will reside in Lombard, Illinois.

**Albert Dietz**, our Professor of Building Engineering at M.I.T. addressed the American Institute of Architects' 1969 Convention at the theme session on Technology—assessing the state of new technologies, and the steps needed to move them ahead. He also participated in the panel discussion on application of plastics for high performance at the International Plastics Conference in London in June.

**Carl A. McKinney** and the McKinney Air Conditioning Company of Houston, Texas, engineered and installed the central gas air conditioning in *House and Garden* magazine's "House of Ideas-1969." Carl has been in the air conditioning field for over 30 years, has authored numerous research papers and taught several courses at Texas College of Arts and Industries on the subject of gas air-conditioning.

We had quite a class turnout for the National Alumni Officers' Conference at M.I.T. in September: Harry L. Moore, Jim Harper, Ike Schwartz, Bob Minot, Lester Glickman, Albert Stewart, Harold Tonsing, Ed Nealand, Don Whiston, and myself.—**Elwood W. Schafer**, Secretary, Room 13-2145 M.I.T., Cambridge, Mass. 02139; **James Harper**, Assistant Secretary, 2700 So. Grant St., Arlington, Va. 22202

## 33

One may scarcely believe it, but the time rolls around again to "Merry Christmas and a very Happy Holiday Season." It is further unconvincing when as we start this immortal essay, it is August 10. So, with our best wishes to you, how about sending me a Christmas present, those who read but do not contribute? Resolve to make it a bit easier for the Secretary, by volunteering personal information to replace the present system which involves extraction. Most of us have had a good year; some of us have not, some have lost a loved one, and some have been unhappy. This, we submit, is the time of year when one thinks of others, so, just start with me.

We have a small sheaf of Alumni Fund capsule stories, which are all short, but more than welcome.

Right smack on top is a capsule from **Prentiss (Lobby) Lobdell** who announces that, after 35 years with Standard of N.J., he is about to take early retirement. Please note the word *take*. Could be that retirement is about to be a bitter dose, but this won't be so, knowing Lobby. Twenty-five of the 35 years have been in the R.C.A. building, New York City. Lobby goes on to the two children, a girl now 18, who entered B.U. this fall, and Kenneth, now 16, who has two more years to go at Westport High. Lobby closes by saying that they expect to live in Westport, at least until the young man graduates. Well, Lobby, I venture a bit of unasked for advice—be sure to find a hobby or equal, which will keep you busy at least half the time. Then, you oughta live forever, and we wish to see that. Thanks for the short one.



Now one from **Carl G. W. Swanson**, civil engineer extraordinary, whose capsule is wholly civil. He says that he took two courses in 1967 and 1969, and has certificates to prove it from the Secretary of the Army, as of Region #1, Maynard, Mass. The courses were: 1) Protective Construction and 2) Fallout Shelter Analysis. His certificates show that he is a recognized, qualified fallout shelter analyst. Thanks for thinking of us Carl.

Now comes **Albert M. Patterson** with his bit which also is more than welcome. Al seems to be a man fully stamped for approval, as his capsule is about his grandson. Grandchild "Chip" is a son of daughter Edith, University of South Carolina, '71, medical technology, and her husband, Sam Ganty III, University of South Carolina, '72, electrical engineering. "Mary and I plug along unspectacularly." No mention of trailer travelling, and do-it-yourself projects. Thanks, Al, and our best to all the Pattersons.

Every man has a right to appear flabbergasted, at least once in a while. Here is one good friend who gilds the lily by sending me two pages of family and personal history and then sends in a capsule. The capsule is from my faithful friend, **Julio C. Ulloa**, presently of Quito, Ecuador. I will not repeat what you have already read, a month or so ago, but I just had to mention one who means it, by a letter and a capsule. Many, many thanks Julio. Keep it up, and won't you write your pal, Robert McCormack, visitor to Ecuador without good intentions or proper frame of mind. I have asked him for his version and I get no reply at all.

Golly, wonders do not cease to cease, or is that it? We had **Donald Newhall** in the interim letter, and now get a capsule from him too, probably written earlier than the other. He again complains that he is being wooed by both M.I.T. '33 and M.I.T. '34. I am writing Don Severance, '38, to get 1934 off this chap's back; the effrontery of these young upstarts. See interim letter for information on Don Newhall, an M.I.T. dropout about 1932, then University of Michigan for his bachelors and masters, '34 and '35. Again, thanks, Don. I will write to Cambridge.

I now proceed to show appreciation to an old friend, **Leighton Rickards**, for his having taken time out to reply via the capsule, as, we hear from Leight but seldom. He moved from Florida to California a year or so ago, and now it appears that he is an employee of the Schalte Lock Co., of San Francisco. Our long-time pal did not contribute any personal history to *Goodridge 25*, so I can't crib from that. However, he does come through with a bit about his family. Two of his daughters are graduates of B.Y.U. and his son has completed his freshman year at the same school. I refuse even to hazard a guess on what B.Y.U. means, and this because Leight might just come

back and tell me. Many, many, of our very best thanks, Leight, and you may be sure that we all appreciate hearing from you.

For the very first time, I think, **Harold William Russell** comes through via the capsule. Most welcome it is, and, as always with these first timers, it is doubly welcome. Harold lets me arrive at my own conclusions and this may be a bit dangerous. He avers that he has four grandchildren, and five step-grandchildren, so we jump to the conclusion that he has been married more than once. I have no way of interpreting the situation so I quote: "My youngest, Roberta, is on her own as a bank teller in San Francisco. The twins, William and Margaret come next. William is a graduate of California, at Berkeley, and Margaret is working her way through the same school and is now a junior. The eldest, Helen, is married." It appears that she, being the only one married, must have the four children, which therefore must be Harold's grandchildren, and Mrs. Russell perforce must be the grandmother of the five others. By golly, sometimes it is fun to work out one of these puzzles but only sometimes. Usually, I prefer just to copy direct. Harold has, by indirect quote, beaten two heart attacks, and is now back in harness, in the U.S.D.A. Lab. From this heart of mine, Harold, I do hope that you do have the stuff licked. So, many thanks and much good luck to your diversified family.

**Gerard M. Kincade, Jr.**, mails us a capsule and this one I can trace a little, as his story about being made a Vice President of St. Regis Paper Co. has already appeared in these pages or in the Interim of September. But the capsule states that he was made a vice president at a meeting April 24, 1969. Inasmuch as a much longer story, submitted by Gerry himself, has already appeared, we will not attempt to repeat. But, still many thanks, Gerry. That, my friends, is the last of the capsule news, but we do have a small press pile.

Good old **Chuck** (Charles to you fellas) **Fulkerson**, makes the press again, for the manyeth time. As of June 13, Chuck was running for the Roxbury, Conn., School Board, in what is called a heated campaign. The Board is apparently regional—a situation quite common these days. Chuck is an incumbent seeking one more term, three years, and "feels that he is qualified because of his two full years' experience on the Board." And, you may quote me, anyone saying that Chuck is not qualified is out of his mind. The Fulkersons have four children Mary (28), Martha (25), Chuck, Jr. (21), and Heidi (12). Chuck, I do hope that you were able to defeat the forces of evil, and were elected to the School Board and congratulations, in any case for winning or trying.

Well, sir, it could not happen to nicer people, and here is one of ours who wrote a publication, about which we hear through the Department of Commerce, Clearing House for Federal Scientific and

Technical information. The culprit is **S. Quimby Duntley**, one of the characters who still owes me a 35th reunion photo. The title of Quimby's effort is self explanatory (to a few), *Experiments on Visual Acuity and the Visibility of Markings on the Ground in Long Duration Earth-Orbital Space Flight*. After flight comes the fly in the ointment—"et al." Quimby, why do you not tell us, through me, who "et al" is? I can understand that "et al" might have helped do the experiments, but surely you, yourself, wrote the book! So, in January, just send me the answer to this one and a photo, 3 by 3. And, no matter who did what to whom, congratulations.

We are in fast company, and that's for sure. In *Astronautics and Aeronautics*, January 1969, we find the short following, with no embellishments, "J. J. Dysart has moved up at Douglas Aircraft to Vice President for Product Support, and the DC 8 and DC 9 Management." After a few minutes with *Goodridge 25*, we find that **Joe Dysart** has been with Douglas almost 20 years, and he and his Veronica have three test pilots, ages 24, 22 and 20. Joe, will you let Veronica read this column so that she can feel really free to write me about the family. I can't remember ever having heard from Joe, and I know that V. can do a good job, being right on the spot, more often and longer. So, my lovely, I await the story. And, Joe our sincere congratulations, even if we are a bit late. It is not our fault that it takes six months for the press to reach us via the clips.

One of our nice girls at the Alumni Fund Office sends us a legible copy of a note on a fund capsule from **Robert H. White**, our class agent, an appointive office, and this makes Bob an ex-officio member of our 40th reunion fund team. He is doubly qualified, as class agent and as recently appointed Vice President of the Torrington Company. This, of course, must be months old by this time, but we still love to congratulate our classmates when it is so well deserved. So, our very best Bob, and to quote, "This place will soon be mine" with one more step up.

For some strange reason, six or eight months ago, I got shuffled into changing the address of our **Morris Guralnick** to a Rhode Island address. That started it, and after much correspondence, not only do I get the address correct, but also a letter from Morris, who says that he didn't know that I needed news items. There was not enough space for Morris on the opposite side of the Note-O-Gram, so Morris wrote a two-page letter. Thanks many millions, Morris. After 14 years of sailing and working for others, Morris came ashore and opened an office, 10 years ago. He is now head man of the firm of engineers, and naval architects. Starting as a one man operation, the firm has grown mightily, and Morris can only describe the limits rather than the total operation. They design floating equipment from 32 feet to 930 feet, with much in between. They are licensed mechanical and electrical engineers,

specializing in communications, and practicing in general engineering. He emphasizes that they do not design such equipment; just the systems which, it seems, can be and are a full time job.

"At my age, you might well guess that my family has developed some new branches. It has. Peggy and I have two children, son Steven, and our daughter, Nina." Steven is an Assistant District Attorney, in San Francisco, and has been married 10 years. Steven and Kathryn have one lovely daughter, which gets Morris into the club. Nina is also married, and she and husband Don Brown live in Ogden, Utah, where Don is an executive of the Crocker-Citizens Bank. Morris makes the sage crack that any additions, further, in the family, will have to come through the children. Oh, oh, Nina has made Morris a grandfather again, this time with a son. Morris, this business of being a long way off is no good these days, as I found two years ago that San Francisco is just a medium-sized nap from Boston (Cambridge). Mark the calendar for the 40th reunion, come June 1973, at the same place as the 35th; Chatham Bars Inn. Morris, I am deeply indebted to you for your nice letter, and I have an idea that a few of your old Course XIII friends may be pleased to see your story—Warren Pease, for instance. Also, best to Peggy, and I'd love to hear from her!

From Stevens Institute of Technology we hear from **Hugh MacDonald**, through a minor address change. Hugh has several times replied to requests of mine in an admirable fashion. He has been with Stevens Institute for 22 years, mostly with the Davidson Laboratory, and on January 1 of this year he moved "up on the hill" and took over the position of Assistant Director of Research, though he has filled in part-time on this job for some time while being Deputy Director of Davidson Laboratory. Hugh says that though the activities at Davidson are closely related to his course at M.I.T., naval architecture, research at Stevens is getting far afield from things maritime.

Hugh's lovely Barbara and his daughter Leal, 28, are well indeed as apparently he is too. Leal is married to Willard Brenegar, a chemical engineer graduate of R.P.I. and Iowa State. Willard is on the research staff of Celanese, at Charlotte, N.C. The Brenegars have a small son 21 months old, and a smaller daughter just one week old on August 1. Apparently the MacDonalds are not much for travelling, but they do have a 35-foot yacht in Maine, and when they can, they cruise in and around Sheepscot Bay and Eastport. Hugh says that they find themselves doing less sailing and more puttering around fixing and changing etc. Hugh, you keep it up and you will never grow old, just tired but happy. Hugh has done better than most of you writing to Ye Secretary two or three times in as many years, but he promises to do better and "Please convey my best regards to all the class." It is done, Hugh, and many thanks, indeed.

Our own Major General **William E. Potter**, who has been with Walt Disney Productions for four years now, recently moved to Florida to work on preparations for the New Disney World there—a great complex of an amusement park, hotels, golf courses, etc. which will probably open in 1971 and should keep Bill busy until then. His army career seems to have taken him many places, as he has a daughter and her three children living in Johannesburg, S.A. and another daughter married and living in Hawaii with her two children. The Potters, I submit, are missing a lot in not being able to see and love their five grandchildren. Our observation is that one may see too much of the little monsters, or too little. So, we see ours irregularly, once or twice a month usually. Thanks for the nice letter, Bill. Perhaps Mrs. Potter can take over and write me (I am never satisfied).

I was just about to send this next fellow a card when a letter came in the very nick of time—**William Bauer**, by name. In June the Bauers started a ten-week European tour, which came to an abrupt end in Italy, where Clare fell and broke both shin bones of her right leg. She had a three-day session in a near-by hospital, where no English or German was spoken, so they set the bones, and installed a proper cast, all in Italian. It all turned out well when they took out the bucket seats of their rented car and proceeded on a two-day auto trip to Frankfurt via the Brenner Pass, the Austrian Tyrol, and into Deutschland at Garmish-Partenkirchen. Bill appreciates the engineering involved in these passes, the four lane Autobahns and Autostrada. They took a direct flight from Frankfurt to Philadelphia and were home just seven days after the mishap.

X-rays to determine how the break is healing show that all is well, and no damage whatever came from the long auto ride, plus hotel and plane (Luft-hansa?). Well, Bill, no one is ever happy about such luck, but one wonders too, if at times, things could be worse. However, out of Bill's carefully planned itinerary, they made the French Riviera, Monte Carlo, Switzerland, the Italian Riviera, and Italy, not necessarily in that order.

Bill is very philosophical, and allows that next year will be just as good, anyway. William, if you take that exploratory trip to Florida, and do not come see me in Hillsboro, I will be very vexed, indeed, so there. Heck, I can help you get took, if need be. Many, many thanks for the good, long, informative letter, and my very best wishes to two of my very best friends anywhere.

With more to come later, but with our anniversary trip within three days, I wish to philosophize a little. It is my firm intention to reply to every piece of mail I get from every classmate, personally. It is not always humanly possible, and hence I do miss probably too often. Please allow me to apologise for an occasional miss and if you ever feel as

though you should have had a reply, won't you forbear or better still, remind me via a post card? I always catch up, but it takes time and many times, I just do not have enough time. I would even put up with a summary court just to be reminded, and I mean every word of it.

Again we start after a two-week lapse, in which Leona and I took a short cruise in (delayed) honor of a wedding anniversary. We met a few classmates in New York for cocktails and dinner at our hotel, the Regency, and a fine time was had by all and sundry. Visiting with us were Jean and **Dayton Clewell**, who took off next morning for Japan, where Jean was to christen a ship for Mobil Oil; Sally and **Don Fink**, who do a lot of taking off, but not this time; Mary and **Guido Garbarino**, who had not yet taken off for Russia etc. and last but surely not least **John Wiley** and sister Marcia, his hostess. John is particularly interested in takeoffs, being Aviation Director for the Port of New York Authority. Another couple, long time friends of ours, was in New York City, and also joined us; Leigh and Olive Hogshire of Norfolk, Va. Leigh said, "I declayuh, I haven't been a part of such a brilliant group of conversationalists in yeahs!" Leigh, be not disturbed; we think that we all are brilliant, no? Factually, and as part of the record, all four classmates are considered to be brilliant by their peers which is why they were chosen in the first place. Leona and I love to be a part of such groups, and there will be more of these small gatherings.

We sailed August 16, to the St. Lawrence river, Nova Scotia, then to Bermuda. All is recommended, plus the *T. S. Hamburg*. We were fortunate in ducking the wash of two hurricanes, and saw nothing but ripples throughout. Incidentally, Don Fink, in a recent note, says that he was quite pleased to see John Wiley again as Don has been a consultant for the Port of New York Authority for some long time. Don sure gets around. Further in incident, the golf situation is settled. Sally did get two holes in three, and not three holes in two, as has been bruited about. Haw!

John Wiley said that he expected to be in Cambridge on September 5 and 6 for the Alumni Officers' Conference, so he can't attend the wedding of **Duke Selig's** daughter, Anne, who is to marry Lane Wimberly in Houston, September 5. So, all of us wish the young couple everything that is good, for more years than we can count on, ourselves. John included Duke's home address; one that we never had, but, it is unofficial unless from Duke himself and we will enter it when Duke says so. Duke and John were roommates way back when.

Another of the faithful, **Cal Mohr**, hoped to attend the Alumni Officers' Conference. Cal comes through with some Mohr (pun) news this time. He has been elected vice president of the newly organized Filtration Society, Chicago Section, and their new publication *Filtration Engineering*, makes its first ap-



pearance in September. Cal seems to have had **Ellis C. Littmann** as a two-hour guest, in July, when Ellis was making a visit to a subsidiary of Nixdorf-Krein, in Aurora, Ill. Cal it is worth a visit to the Littmann home to see those Danish Christmas plates, of which Ellis and Roz have all but one of a complete set. They are marvelous. The subsidiary, Lillibridge Corp., makes a kicking net, designed to catch the kicked ball (foot) when necessary to assist the Coach in making constructive criticism of the kicks. It appears that Lillibridge makes many kinds of nets for various sports, and the new net is just one more in a higher priced field.

Cal and Ellis discussed the 40th reunion gift at some length, but not much could be accomplished in so short a time. However, one Vice President is now up to date, as Ellis is going ahead fast. I do believe that I will await first hand news from Ellis before using the information. But, the 40th is on the way, and will be here sooner than we think. Fellows, this is the big one. When some of Ellis' committee writes you, or Ellis himself, please reply at once. The job is singularly thankless, and these chaps who do the work would appreciate a prompt reply. Your habits in making replies are already well known (to me). You cannot hurt my feelings; there are none. I just keep pounding away, Dr. Goebbels style. But, these Reunion Committee men are not used to you as I am. Please reply at once, even if you send in a flat no.

Now, for a big batch of smaller items, but on bigger and bigger men. First, **Bob Winters** is a new Director of Kaiser Resources, Ltd., formerly Kaiser Coal. Ltd. As an aside, Kaiser Steel is 59 per cent owned by Kaiser Industries Corp. Now Bob can keep both hands busy.

**Don Fink** (the irrepressible) earlier was again honored by his professional society, the I.E.E.E., with a special pin as one of 28 living past presidents.

Maddeningly short is a bit about our own **Herbert E. Grier, E.E.**, President of CER Geo-Nuclear Corp. Herb is shown signing an agreement with the A.E.C., and the Austral Oil Co. for his company, wherein they intend to detonate a 40 kiloton nuclear device 8,400 feet underground to release a natural gas formation. The site is near Rifle, Calif. a most appropriate location, no? Details are not given so we cannot expand. Perhaps Herb would reply to one of you were you to write him as a personal friend. He does not write to everyone as I have found out.

Now, here is one a little nearer home: Headline, "Two Safety Service Giants Retire"! One of the giants is our own **C. W. MacMillan** (Chuck to you fellas). Now, I never thought of Chuck as a giant, but, his 20 years with Bear Mfg. Co. proves that he is more than an ordinary engineer. This fine article gives Chuck a great send off by stating that his work in R & D on practical safety equipment has been outstanding. Though the retire-

ment is mandatory, Chuck has been retained by Bear as a consultant. Gosh, I never knew that Chuck was as old as I am, but his picture proves that I am just a boy, so there. I never did know that Chuck was a former Colonel in the Army. Maybe that is why he eventually located at Rock Island. Further, and this is important, I do not suppose that the lovely Helga Mac will ever forgive me for not recognizing her in the LaSalle St. station some years ago. She must be still mad at me, or she would have written as other girls do. Is it so Helga? Chuck, as one old friend to another, please, oh please, tell me how busy you are going to be in retirement, which by itself does not matter, but not doing anything is fatal.

By Golly, here is another old tried and true Course II, M.E., **Neil E. Hopkins** formerly of Maine, now of York, Pa. Hop has been appointed Chief Product Engineer of absorption systems, at York Division of Borg-Warner Corp. For nine years he has been a specialist in Lithium Bromide refrigeration absorption systems, and now he will run the thing. Hop has a masters from his old school, and no doubt has wished many times that he neglected to go all the way to a doctorate. He went to work for York just out of graduate school in 1934 and Hop has always been an engineer for York in large industrial refrigeration systems, refrigeration equipment development engineering, mainly on automatic ice makers. For several years after the development phase, he was Director of Research, and then served as staff engineer on special projects. He belongs to the Pennsylvania Society of Professional Engineers, and the A.S.M.E. Steve Crick will join me, I know, in congratulating Hoppy on his promotion, as he, like me, might never have gotten out of M.I.T. with a degree were it not for Hop. Our very best, Hoppy, to both you and your lovely Ruthie. Please mark your calendar for the 40th, come 1973.

As you read this column, you will find that there are less than four years to go to the 40th Reunion. Though you have probably not yet been contacted, please allow me to remind you that all donations to the M.I.T. Alumni Fund for the five fiscal years starting July 1968, are counted as part of the 40th Reunion Class Gift Fund, Ellis C. Littmann, Chairman. Many of those who donate like to pledge the same amount for each of the five years, which, you may note, spreads it out so that it is almost painless. It is my understanding that your President, Jim Turner, Chairman Ellis Littmann, and some others, are carefully selecting a working committee, to be known as the 40th Fund Committee, I hope. This will be announced in due time. I do not propose to interfere in someone's else business, and vice versa, but, I do hate to send out anything that does not mention the 40th Reunion Gift Fund.

The following are still reluctant about sending in photos of themselves for later display at the 40th! Werner Bachli (that

lunch was not for nothing, Wern), George Bentley, Charlie Bradley, Maurice Brashears, Laurence Brown, Joe Carbonell (come Joe, I got the story, where's the pitcha?), Charlie Cashman, S. Q. Duntley, Guido Garbarino, Richard Hodgdon, Ferd Johnson, Len Lindsay, Steve Rhodes, Robert Richardson, Fred Roetting, and James (Jim) Welch. Please note, all, that each of these characters has been asked twice by mail, and once more in the columns. So until the January issue, we are always at your service. If I can get it for you, do it for you, or say it for you, you have only to ask. Whatever became of Slick Henderson?

We have a few address changes and anyone wishing an address, or anything at all, just drop me a line. To get fast service, always include your recent family story, or a short biography. If this is left out then I have no incentive to hurry for you, or even notice who you are. M.I.T. and the '33 class news come first. All else comes second. So, when you give me something to use in the news, you are first.—Changes of address for the following are available: Vernon O. Bowles, CH(X-A), Guido M. Garbarino, CH(X), Richard E. Payzant, CE(I), Richard S. Rowe, AR(IV), and George V. Sweetnam, MG(XV).

That's it, folks, You will have long since read our Interim letter mailed the week of September 1 according to Fred Lehmann, our secret collaborator. Just to show how good '33 is, it is the only Class whose full roster is contacted at least once a year (interim letter). Class news in the *Review* is received only by members of the Alumni Association of M.I.T. Again, Merry Christmas, and a Very Happy New Year.—**Warren Henderson**, Secretary, Fort Rock Farm, Drawer H, Exeter, N.H. 03833; after November 15, 1079 Hillsboro Beach, Pompano Beach, Fla. 33062

## 34

One of the sure signs of the approach of autumn is the Alumni Officers' Conference, usually held in Cambridge the weekend after Labor Day. This year there were six members of the class attending: John Hitchcock, Art Miller, Jean Raymond, Proctor Wetherill, Paul Wing, Jr., and myself. The proceedings are detailed elsewhere in the *Review* for those officers who couldn't make it. But if your alumni activities bring you an invitation, and you've never come to one of these meetings, you've missed a real chance to find out what the Institute is like these days. Try to remember this for next year.

One of the class members who has helped (and still is) as an assistant secretary is **Jim Eder**. A letter he wrote **Sam Untermyer** following a change of address notice has brought forth the following from Sam (see last month's notes for his new address).

"Sorry for the delay in answering your



letter. Since Joan died in 1962, I have been quite busy caring for four children. I have a boy Samuel, III (25), a married daughter Sylvia Smith (23), a daughter Beatrice (21) and a son Daniel (18). Despite their ages, they still receive some supervision. This winter I bought a small house here overlooking the bay. About two years ago, four of us left General Electric (Atomic Power Equipment Department) and started a small business called "National Nuclear Corp. We are at 701 Welch Rd., Palo Alto, and we have a small lab at another Palo Alto location.

"Besides general consulting, we have developed nuclear fuel assay equipment which we sell or lease. We have contracts with Westinghouse, Commonwealth Edison, Office of Saline Water, etc. First year was not very profitable, but we have been doing much better than expected this year. If this continues we'll have to expand.

"I am also slightly involved in a company called 'Printex' which makes printed circuit boards. This has been quite profitable and we hope to sell out for capitol gains. With the passing of years, I have also accumulated various family responsibilities in the East, these being calculated to keep me extra busy.

"George Merryweather, '34, lives around the corner at 21 Ash Lane (Portola Valley). He lived here two years ago, moved back to Cleveland, couldn't take it, and returned. As you may know, his first wife died about 10 years ago, and he remarried. They have a total of some seven children. It was good to hear from you. Stop in if you come West."

I was particularly glad to see this letter. I lived two rooms away from Sam in Monroe and I don't think I've heard about him since we graduated. I hope it will inspire some others to write.

On a more somber note I have a letter from Joseph Harrington, '61, concerning the death of one of our classmates, **Lawrence A. Monroe**. He writes: "I am sorry to have to report to you the death of Lawrence A. Monroe, a loyal M.I.T. alumnus with whom I had the pleasure of working in recent months. Larry lived at 1311 Chicago Ave., here in Evanston, and had worked for R. R. Donnelly and Sons for the past ten years in Research and Development. He was found dead in his room on July 22. He apparently died of a heart attack the previous weekend. He was 57.

"I am sorry that I can't give you more information. There is certainly more that can and should be said. Perhaps friends of Larry's who knew him in the past can fill in some of the gaps between his doctorate in chemical engineering from M.I.T. and the present. I know him only as a good friend and a vigorous and effective campaigner worker and organizer in our Evanston area campaign to boost participation in the Alumni Fund. One of the big dividends for me of organizing the drive in this area turned out

to be the opportunity to meet and work with Larry. He leaves a cousin, Kent Macy, of Peoria, Ill., and no nearer relatives."

A letter like this is a fine tribute to a man who obviously worked hard for the Institute. Perhaps someone who reads this can fill some of the gaps mentioned by Mr. Harrington.

From the Alumni Office comes the notice of another death in our class—**John T. Odbert**. By odd chance his death was on July 23, just a day later than the loss mentioned above. At the moment all I can tell you is that John was living in Kenil, N.J., and according to the Alumni Register, was working at Picatinny Arsenal. I hope to have more information later.

Herewith, the latest group of address changes received from the Institute. If they mean more than just a new house, why not, when the dust settles, drop me a line and tell me what was involved so it can be shared with your friends.

Edward L. Asch, 10727 Tupper Lake, Houston, Texas 77042; Floyd R. Carpenter, Kaiser Center, 4 Huff Ct., Morago, Calif. 94556; Rodolfo J. Gonzalez-Garza, Apartado 2033, Monterrey, N. L., Mexico; Kendrick H. Lippitt, 23830 Audrey Ave., Torrance, Calif. 90505; Edmund D. Lucas, Jr., 520 East 4th, Tustin, Calif. 92680; Alan McCullough, 3805 Cutshaw Ave., Richmond, Va. 73230; John L. Newbegin, 3549 Baldwin Dr., Easton, Pa. 18042; Howard L. Reichart, Jr., Les Haut Crets, 1261, Cheserex, Vaud, Switzerland; Samuel Untermeyer II, 201 Escobar, Partola Valley, Calif. 94205. (This last address is new since the June listing.) Henry C. Miller, Jr., Arboretum Dr., Chapel Hill, N.C. 27514; Robert K. Roulston, 59 Bartlett St., Andover, Mass. 01810; Richard H. Zinszer, 206 W. 26th St., Hays, Kansas, 67601. Thanks to a note from **Richard Zinszer** to the Review, I can tell you that this was quite a move—from Saudi Arabia, following his retirement from the Arabian American Oil Co. Something about his life out there should make interesting reading for us.—**Robert M. Franklin**, Secretary, Satucket Rd., Brewster, Mass. 02631

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**Ned Collins** has contributed a nice newsy letter as follows: "During my vacation a few weeks ago I had a couple of interesting experiences which may interest those of our classmates who know the parties involved, so here goes the story.

"When in Norwalk, Conn., I stopped in to see **Lester Brooks**, who is Vice President in charge of Research for the R. J. Vanderbilt Company. I got a real laugh out of what he answered when I suggested we go out and play a round of golf—to wit—"What do you want to do, get me fired?", he said, and in the same breath added, 'How many strokes will you give me?' Needless to say, it is obvious his

mother didn't raise any stupid children. To add insult to injury, he took me to his club and 'murdered' me—what slim chance I might have had went completely down the drain when he sank two approach shots on the first and third holes which made him two under par for the first three holes. That finished me, although after awhile he started to 'back a few' of his own, and wound up with an 87 which wasn't bad at all for a 16 handicap golfer.

"A few days later I visited **Walter Byrne** at his home in Short Hills, N.J. As you may recall Walter has had his own management engineering firm for the past 25 years with offices at 140 Broadway, New York City. That in itself is no small accomplishment, but it pales into insignificance when compared to his most recent achievement of seven months ago when his wife gave birth to Mark Byrne, a handsome, husky, baby boy! Considering the fact that he has four married children and seven grandchildren, I think that Walt has set a record all his own that no one in the Class of '35 can even approach.

"For the second time in a row **Allan Mowatt** beat me in the Golf Tournament, this time only two up in match play. Considering the Handicap difference in my favor, I should have 'clobbered' him easily but as long as I continue to try to 'kill the ball' on my downswing, I'll have to suffer such ignominies and wait another year to get even."

**Art Haskins** is still sailing the briny deep. His report says: "In accordance with custom for those with sail boating as a hobby, I keep getting a bigger and bigger boat. Now have a Bristol 27. Took top honors in the Monhegan-Manana 90-mile overnight race out of Portland, Maine, last year. That makes two out of three years for first in class, first M.O.R.C., and first for Manana Trophy. Took fourth in class the third year. Also did well with the same boat in the Casco Bay Interclub Races against other cruising class boats."—Co-Secretaries: **Phoenix N. Dangel**, 329 Park St., West Roxbury, Mass. 02132; **Irving S. Banquer**, 20 Gordon Rd., Waban, Mass. 02168

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Four members of the Class were listed as expecting to attend the Alumni Officers' Conference in early September. In the brief period I was able to participate I did not see either Mal Graves or Leo Kramer. There may have been others. I did talk with **E. Hibbard (Hib) Summersgill** who was present and has been a member of the Educational Council for several years. He works out of Longmeadow, Mass., where he makes his home, for du Pont Dyes and Chemicals Division sales department. His son and daughter are married and he and his wife are proud grandparents. He has spent considerable time in recent years working with the pulp and paper industry trying to interest more technically trained personnel to enter the

field. (Hib used the word "men" but this ardent believer in womanpower substituted the word "personnel.") One of Hib's greatest loves is music and he attends as many Tanglewood concerts as possible. He ushers three on occasions.

**Boynton Beckwith** writes from Arlington Heights, Ill., with his Alumni Fund contribution that he has remarried following a divorce. The new Mrs. Beckwith is the former Virginia Clark Holm of Kansas City and Denver. He also said of the late Morgan Rulon, "Our class has lost a good man and benefactor."

At the time of writing these notes newspapers are reporting that **Semon Knudsen** and the Ford Motor Company have reached a parting of the ways. It will be interesting to observe where "Bunkie" puts his talents to use next.—**Alice H. Kimball**, Secretary, P.O. Box 31, West Hartland, Conn. 06091 or 221 Lake View Ave., Cambridge, Mass. 02138

## 37

On last Alumni Day our Class was represented by Godwin Gay, Rutherford "Colonel" Harris and Phil Peters with their respective wives. **Phil Peters**, as you know, is serving this year as President of the Alumni Association and in addition is serving as an ex-officio member of the M.I.T. Corporation. He is also a director of the Greater Boston Chamber of Commerce, the Boston Rotary Club and John Hancock International Services, S.A., for Brussels and Belgium as well as being a senior vice president of John Hancock.

**Charles Blessing** is presently Director of City Planning of the Detroit City Plan Commission and was a speaker at the convention of the North Central States Region and Wisconsin Chapter, A.I.A.

**Al Woll** is president of the Evansville-Vanderburgh, Ind., school board. He has served for over 10 years on the board. Al has many business interests—oil, farming and investment management.

**Sam Noodelman** has recently been promoted to Vice President—Engineering of the Inland Motor Corporation of Virginia. While employed by Delco Products Division of General Motors as an engineer he developed noise standards and test methods. As a research development engineer with M.I.T. Radiation Labs he received the Presidential Merit Citation. Joining Inland Motors in 1965 as Chief Design Engineer, he was promoted to Chief Engineer in 1967. Sam has a son, Lewis, who is attending M.I.T.

**Norm Birch**, manager of the International Division of the Hayes-Albion Corporation, has been named to membership on the National Council of the National Planning Association. He worked in metallurgical quality control for the Armco Steel Corporation from 1937 to 1939. From 1939 to 1942, he was with the American Brake Shoe Company in research-process control, and from 1945 to 1949 he was a

process metallurgist. He served as chief metallurgist at the National Bearing division from 1949 to 1954, vice president in 1954 and director of research from 1955 to 1961. He was technical director of Albion Malleable Iron Company from 1961 to 1967 when he assumed his present position. Norm was a director of the World Affairs Forum of Crawford County from 1952 to 1954 and is also patentee of an electrode holder. Norm with his wife Elvie, lives in Albion, Mich. and also has a vacation home in Carver, Mass., on Cape Cod.

**Charlie Witsil** is now senior engineer with E. I. du Pont de Nemours Co., Inc., at Old Hickory, Tenn., working on new products. . . . **Michael Zinchuk** is with the Polaroid Corp., at Technology Square. . . . **Phil Short** owns a nursing home (extended care facility). . . . Professor **Leo Moore** of M.I.T. has moved recently to 6 Winthrop Rd., Lexington, Mass. 02173. . . . **Ross E. Black** has received his Master of Science degree in nuclear engineering science from C. W. Post College in Brookville, L.I.

It is with sadness that I report the following deaths: **William B. Bunker** on June 5; **John C. Hiit** on June 25; Klaus Otto, stepson of Bernhard Schondorff of Erkelenz, Germany, on July 11; **Walter Regnery**, Vice President of Joanna Western Mills Company and executive officer of the Joanna Plant, Newberry, S.C., on October 26, 1968; and Dr. **Vincent Kron**, who received a medical degree at the University of Rochester, interned at Johns Hopkins Hospital, and was M.I.T. Alumni Representative of the Corporate Medical Visiting Committee, on February 19.—**Robert H. Thorson**, Secretary, 506 Riverside Ave., Medford, Mass. 02155; Professor **Curtiss Powell**, Assistant Secretary, Rm. 5-325, M.I.T. Cambridge, Mass. 02142; **Jerome Salny**, Assistant Secretary, Egbert Hill, Morristown, N.J. 07960

## 38

The Class of 1938 was well represented at the Alumni Officers' Conference in Cambridge September 4 through 6; your secretary attended as well as class agent **Frank Kemp** and his wife Ruth, **Johnny Glacken**, and, of course, in an ex-officio capacity, Phyl and **Don Severance**. Frank reported that he has acquired a summer residence at Sterling Forest, N.Y., and all of '38's substantial contributors to the Alumni Fund, are eligible to sponge a weekend from him. Frank also reported, a bit smugly I thought, that in the 1969 Alumni Fund our Class outdid itself, both in percentage participation and in dollars.

With this issue, I am establishing a new policy. Each month there is a deadline for class notes. Any of you who can furnish me with grist concerning other classmates will be designated roving reporter of the month. Rover for December is **Fred Kolb**, 211 Oakridge Dr., Rochester, N.Y. He ran across a flyer from U.C.L.A.'s

Life-long Learning Program, listing **Jack Rosenberg** as leader of a seminar on Interactive Production Control. Jack is billed as a consultant, Pacific Palisades, Calif. As Design Engineer, Institute for Advanced Study, Princeton, N.J., he designed and developed the arithmetic unit of the first stored program computer for John von Neuman. For General Dynamics he designed, developed, and installed the Digimatic line of numerical controls, one of the first generation industrial control systems. As manager of the engineering dept. at I.B.M. Los Angeles Scientific Center, he was responsible for development of the first working direct numerical control system, a second generation production control system, and new servo techniques for achieving data compression by very large factors.

**Ravi Kirloskar** and his wife spent an evening in Rochester with Fred last summer. Ravi is chief executive of Kirloskar Electric Co. Ltd. in Bangalore, India, which is a part of Kirloskar Brothers. This business was established in 1903 as a bicycle repair shop by Ravi's father and uncle and has since diversified into agricultural implements, housing, diesel engines, pumps, machine tools, electric motors and transformers, and now employs over 30,000 in 11 plants. Because of the tremendous economic contribution to India's economy by Kirloskar Brothers, India issued a 20-pie stamp last June in honor of Ravi's dad. Working with Ravi is his brother Shantanu Kirloskar, '26. The first day cover which is reproduced herewith is to me a symbol of the contribution M.I.T. is making world-wide.

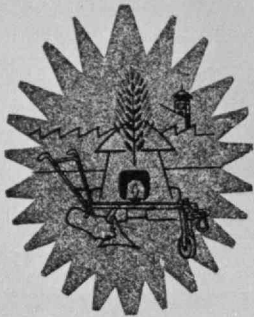
Fred did not have much to say about himself, other than to mention that his oldest daughter Carolyn and her husband, Bob Grafton, passed through en route to England, where Bob is visiting lecturer in mathematics at the University of Leicester. Contrast: MerriBeth, the youngest, has just entered the 4th grade!

Two classmates had important roles in Apollo 11: **Charley Donlan** is a deputy associate administrator for manned space flight at N.A.S.A. His office is responsible for the planning, execution, direction, and evaluation of N.A.S.A.'s overall manned space program. **Henry Homeyer**, who is presently a consulting engineer in Woodbridge, Conn., undertook to design and produce a tiny but vital valve seat used in the regulation of gas pressure in spacecraft fuel cells, which in turn provided the power which ran computers, TV, radio and navigational systems in both the lunar and command modules, all of this after several would-be makers gave up because they could not meet N.A.S.A. standards. Incidentally, according to my information, this is not about to make Henry's fortune. Apollo 11 used 6 at \$40 per copy; however, this fits the Homeyer sense of public service—his bride is a social worker, a son teaches in a ghetto school in the Garden State, and a daughter is working in urban renewal in Canada.



प्रथम दिवस आवरण  
FIRST DAY COVER

20 - 6 - 1969



लक्ष्मणराव किरलोस्कर  
LAXMANRAO KIRLOSKAR  
1869 - 1956

भारतीय डाक-तार विभाग INDIAN POSTS & TELEGRAPHS

*Because of the economic contribution to India's economy by Kirloskar Brothers, a company founded in 1903 as a bicycle repair shop, this special stamp was issued by the Indian Government in commemoration of Laxmanrao Kirloskar—father of Ravi Kirloskar, '38 and Shantanurao Kirloskar, '26.*

**Dick Muther**, who heads a Kansas City firm of consulting engineers, gave a talk this summer at a Professional Engineers in Industry Board of Governors meeting, crystal-balling the future of the profession. . . . The *Wall Street Journal* reported that **Art Alexander**, president of Kennametal of Canada, Ltd., has been made a director of the parent company.

Among those present at last September's Alumni Seminar in Cambridge were: Virginia and Dick Henderson, Connie Roosevelt, and Anne and John Summerfeld.

**John Summerfeld** and his bride came in from Los Angeles, where he is Vice President for Economic Planning with Western Airlines. John reports that he is involved in flight scheduling, tariffs, research and long-range planning. Application of management and information science to airline problems occupies a large part of his time.

Frank Kemp and I are planning to drop down to Mexico City for the M.I.T. Mexican Fiesta March 12 to 14. How about some of you, too?

Merry Christmas to all '38ers; the best return greetings you can send will be your application for roving reporter (complete with copy).—**A. L. Bruneau, Jr.**, Secretary, Hurdman and Cranstoun, Penney & Co., 140 Broadway, New York, N.Y. 10005

## 39

Having been unable to attend the reunion, I asked **Ernie Kaswell** for details, and he responded with this excellent letter: "Dear Oz: We didn't get a chance to talk at length on Alumni Day about the Reunion, held at Wychmere Harbor Club (formerly Snow Inn) in Harwichport. Per-

haps it is presumptuous for the chairman to say that everyone had a good time, but I do believe that it was a very enjoyable week-end for all.

Those in attendance were: Ben and Gay Badenoch, Dave Bartlett, George and Eleanor Beesley, Bill and Lucile Brewster, Bob and Dodie Casselman, Irving and Olive Cohen, Joe and Jean Dana, Eli and Jan Dannenberg, Lawrie and Alicia Fabens, Barry and Jean Graham, Ben and Anne Howes, Ernie and Yolande Kaswell, Martin and Mary Lindenberg, Joe and Blossom Mazur, Shorty and Nina Merri-man, Manning and Connie Morrill, Harold and Betty Muckley, Art and Caroline Olson, Harold and Veronica Pope, Bill and Adie Pulver, Al and Maureen Rugo, Louis and Mim Castleman, Orlando and Lillian de Aragon, Hugh and Mona Kennison, Henry Littlejohn, Mort Metzger, Maury and Ruth Meyer, Bob and Betsy Sackheim, Fred and Anne Schaller, Al and Dorothy Schreiber, Harold and Hilda Seykota, Seymour and Silvia Sheinkopf, Paul and Theo Stanton, Bob and Aletta Touzalin, Irwin and Arlene Weiss, Aaron and Edith White, Bill and Anita Wingard, Arthur and Marilyn Quint, Don and Gloria Scully, Vija Sethaput, Bill and Frances Widlansky, Joe Zeitlin, and Arthur and Helen Zeldin.

"This made a total of about 81 people plus a dozen or so children. A goodly number of old faithfuls were present: Dave Bartlett from Tulsa, Barry and Jean Graham from Montreal, Orlando and Lillian de Aragon from Puerto Rico, Al and Dorothy Schreiber from California, Harold and Hilda Seykota from Florida. The prize for distance went to Vija Sethaput from Bangkok and Joe Zeitlin from Israel. (I wish I could find Vija's business card, but I've misplaced it. I believe he's with the Thailand government in one of the ministries pertaining to mining and metallurgical operations.) Joe Zeitlin is Pro-

fessor of Civil Engineering at the Israel Institute of Technology, Technion City, Haifa, Israel.

The reunion was very informal, and at our age (?) the committee felt it was not necessary to develop a vigorous, active program. We have many golfers, a few tennis players, and based upon the Reunion Treasurer's (Aaron White) report, a sufficient number of drinkers to uphold the class tradition.

"Several weeks prior to the Reunion, your chairman wrote to all potential reunioners, asking them to donate consumer products their companies made for use as drawing prizes at our banquet. The response was magnificent. We had enough prizes for every individual or family group to go home with something. Examples of gifts included a carton of rum (Orlando de Aragon), a set of Wear-ever aluminum cooking pots (Jack Hamilton), and a flagpole with Flag (Manning Morrill). The drawing of these gifts constituted our banquet entertainment. Via our Class Notes, I want to thank the people who contributed—particularly those who couldn't attend.

"Of course you know that we invited Frank Sargent, Governor of Massachusetts, to be our guest of honor. He unfortunately couldn't attend, but when he spoke at the Alumni Day Luncheon, I had the pleasure, as you know, of presenting him with an inscribed silver tankard, a gift from the members of the Class of 1939.

"At our formal class meeting, chaired by President George Beesley, Class officers were elected as follows: George Beesley, President; Ernest R. Kaswell, Vice President; Aaron White, Treasurer; Seymour Sheinkopf, Class Agent; and Oswald Stewart, Secretary. Note: Bob Casselman was Chairman of the Nominating Committee. It is an honor for all of us to represent and serve the Class.

"A Class picture was taken, and will be mailed to all registrants within a month or two. We may have some spares; if anyone would like one, I suggest they communicate with me or you, and I will try to send them one as long as the supply (if any) lasts.

"Orlando de Aragon suggested that we should not wait an additional five years for another reunion, and proposed that we hold a Winter Reunion two or three years hence in Puerto Rico. Many '39 ers present thought this was a good idea, and it was agreed that we should keep it in mind—possibly for the early Spring of 1971. We should all save our pennies and plan to go.

"That about wraps up the Reunion.—On a personal note, things at FRL® continue to be interesting and active. I was proud of the fact that FRL® produced several of the textile items that went into Apollo 11. These were mostly composed of an exotic new fiber called PBI that doesn't burn in air and has quite good fire re-





W. Van Sciver, '40



C. L. Milton, '40



J. A. Burges, '40

sistance in 100% oxygen environments. Among the items was the pulley cordage used to convey the lunar rocks up into the module. The Kaswell family is fine. My daughter, Jeanne K. Sager, is married to a Course XVI, 1968, man and is living in Houston where her husband works for N.A.S.A. on navigation. Gordon, our older boy, starts as a freshman at the University of Rochester. Stuart, our youngest, is in high school. Best regards. Ernest R. Kaswell"—**Oswald Stewart**, Secretary, 3395 Green Meadow Circle, Bethlehem, Pa. 18017

## 40

**John Burr** has joined Herb Holloman at the University of Oklahoma. John is now a professor in the organic division of the chemistry department and is the author of *Tracer Applications in the Study of Organic Chemistry*. John says: "Left the North American Rockwell Science Center January, 1969. Thoroughly enjoying the opportunities for a broader spectrum of research in a major university, and of course the university atmosphere! As of June have four children graduated from university—the oldest, son John, is a graduate student in molecular biology at Berkeley. One daughter just finished first year at University of Toronto, and two more (sons) coming up in a few more years." John has only seven children, a few behind our next correspondent, **Jorge Echarte**: "Our ninth child (a beautiful girl) was born this past October (1968), three of our children are now in college, and my calculations show that for the next sixteen years we will have at least two in college. I am in the process of developing and constructing a Sixty Million Dollar project in Boynton Beach, Fla. This development comprises 3,200 homes and 900 apartment units. Another venture I am working on with Whale Land Development, Inc., of Tennessee is located on the Dade-Broward County line in Miami, Fla. This is a One-hundred and Forty Million Dollar project and consists of 4,500 apartment units clustered around an 18-hole, championship golf course and a 40-acre lake. Included will be a 240-room motel and an enclosed mall shopping center. We are calling this project Leisuretoun . . . and believe me, when

it's completed, it's going to practically be a city!"

**Wes Van Sciver** who is Professor of Physics at Lehigh University is on leave of absence this year and will spend his time doing research at the Solid State Physics Laboratory of the University of Toulouse, France. . . . **John Berges** is now General Manager of General Electric's Appliance Control Department, Morrison, Ill. John and Margaret with their four youngest children, David (19), Michael (17), Ann (13) and Patricia (11) have moved from Louisville where John was General Manager of the G.E. Refrigerator Components Department to Morrison. Their oldest son, John Jr., is in the Armed Forces and their second son James is enrolled in General Electric's Manufacturing Management Program. . . . A member and former member of our Class are among the new officers of the Illuminating Engineering Society as of October 1, 1969. **Bob Dorsey** who is Manager, Lighting Development, Large Lamp Department of General Electric in Cleveland, Ohio, is now General Secretary while George Clark ('41) Manager of Lighting Equipment Design for Sylvania's Lighting Equipment Design Division in Danvers, Mass., is the new Treasurer.

**Clare Milton** who has been with Eastern Products Corp., since 1951 has been named Vice President of Development Engineering. . . . Lots of brief comments from classmates this month. **Leonard Weaver** notes "Both daughters married within last four years. New grandfather of one girl and two boys. Occupation—still Product Development Manager, Building Products Division, Bird & Son, Inc. Just completed 2-year term as Chairman, Rigid Vinyl Exterior Building Products Division, SPI." . . . **Louis Tura** advises he is now Vice President and Construction Manager of Aberthaw Construction Co., in Boston. . . . **Clark Goodman** relates that he has been appointed Chairman of the National Academy of Science Committee on Radioactive Waste Management. . . . **Chet Livingston** says, "I am now a flight Safety and Aircraft Operations Engineer on Lockheed L-1011 'Tristar' airbus."

Those present at Alumni Day activities June 16, 1969, were Bob and Mrs.

Bittenbender, Jack Danforth, Russ and Mrs. Haden, Phil Stoddard, Jim Baird and Bernie and Mrs. Feldman.

Next June we will hold our 30th reunion. Your Secretary and his wife plan to come and hope to see many of you there. More details will be furnished in later issues. This is also the time for election of officers for the next five years. Send your suggestions for the new officers to either Bob Bittenbender or your secretary.

**Stanley M. Smolensky** was the banquet speaker at the 15th Annual Meeting of the Institute of Environmental Sciences dinner held in the Magnolia room of the Disneyland Hotel, Anaheim, Calif., on April 22, 1969. Stanley is assistant to the director in the Office of Policy, N.A.S.A. Washington, D.C.

**Dave Sunstein** is president of General Atronics Corporation which merged not long ago with The Magnavox Company. . . . **John Berges** has been appointed general manager of the General Electric Company Appliance Control Department in Morrison, Ill.

**Howard Klitgord** is now vice president of Huffman Corp. Previously he was manager of industrial engineering of the Taylor Instrument division of Sybron Corp.

Our apologies to **Jorge Echarte** for a typo in the July-August Review. His Condominium Apartments project is planned for only 4,500 instead of 45,000. The only comment we can make is that naturally anyone with nine children must plan big.

See you at our 30th in June.—**Alvin Gutttag**, Secretary, Cushman, Darby & Cushman, American Security Building, 730-15th St., Washington, D.C. 20005

## 41

**George W. Clark** has been promoted to the position of Chief Engineer of the Lighting Equipment Division of Sylvania Lighting Products, an operating group of Sylvania Electric Products Inc., subsidiary of General Telephone and Electronics Corp. George has been with Sylvania

since 1948. He has been a District Lighting Engineer, Supervisor of Commercial and Product Engineering Fixtures, Manager of Engineering Fixtures, and Manager of Marketing-Lighting Equipment in consecutive periods prior to his present position.

**Henry Avery** has been named Vice President—Plastics at United States Steel's chemicals division in Pittsburgh.

**George M. White** has been elected a vice president of the American Institute of Architects at their 1969 Convention of Delegates. He is a principal in a Cleveland firm carrying his name. In addition to his B.S. and M.S. from M.I.T., George has received an M.B.A. from Harvard University and an L.L.B. from Case-Western Reserve University. He is chairman of documents review committee and past chairman of insurance committee of the A.I.A. A former member of the faculty in architecture and in physics at Case-Western Reserve University, he has also been a speaker on professional liability, insurance and construction law at state, regional and national A.I.A. meetings and conventions since 1961. He is also a lecturer on law for A.I.A.'s Professional Development Program and has been a trustee of A.I.A.'s Group Life Insurance Program since 1964.

**Robert Sinsheimer** was a speaker at a recent meeting of the American Association for the Advancement of Science in Dallas where he presented his views on man's ability to control his evolution. In his words: "All that seems needed is the technology to transfer what we already know to be feasible in bacteria, carrot cells or frogs, to man. I feel strangely akin to the physicists who pointed out in the 1930's that the principles required for the release of the energy locked in the atomic nucleus were understood. Here too, the principles seem in hand." He sees in genetic technology the potential realization of man's ancient dream of self-perfection. He says: "The new eugenics would permit in principle the conversion of all of the unfit to the highest genetic level. I know there are those who find this concept repugnant, but they do not see our present situation whole. They are not among the losers in the chromosomal lottery that so firmly

channels our human destinies. Repugnance isn't the response of the four million Americans with diabetes, or the 250,000 children born in the United States every year with genetic diseases or the 50 million healthy Americans whose I.Q. is below 90."—**Walter J. Kreske**, Secretary, 53 State Street, Boston, Mass. 02109; **Everett R. Ackerson**, Assistant Secretary, 831 Cranford Ave., Westfield, N.J.; **Michael Driscoll**, Assistant Secretary, 63 Center Street, Nantucket, Mass.

## 42

**Lloyd St. Jean** who was General Manager of the Plainview Division of Sanders Associates is the President of Interface Industries in Huntington, N.Y. Interface is a new company offering custom designed computer systems featuring remote input-output devices as well as system components such as terminals and modems. From the news release (for those who don't know, including me), a modem is an interface adaptor that translates computer signals into a form compatible for transmission over data links.

From the U.S. Army Weapons Command at Rock Island, Ill. we have an announcement that **Art Sweeney**, Deputy Commander of W.E.C.O.M. has been promoted to Brigadier General; Art got an M.B.A. from Harvard Business School in 1947. Some of his interesting previous assignment in the army include the Military Advisory and Assistance Group in Cambodia, Assistant Military Attaché at Berne, Switzerland, production planning for the Redstone and Jupiter missiles in the Army Ballistic Agency and membership in the United States Arms Control and Disarmament Agency.

Still with the military, Captain **Bernard Moulton** (U.S.N.) writes, "In March, I was detached from duty in Washington as Plans and Programs Officer in the Office of Naval Material and ordered to Yokosuka, Japan. Arrived in Yokosuka in May and took command of Fleet Training Group, Western Pacific." With that for a lead, Bernie, how about dropping us a line about how things are in Japan these days?

**Robert M. Cunningham** is listed as a speaker on "Cumulus Modification" at the spring seminars of the M.I.T. Department of Meteorology. . . . From the *Lexington Minute Man* we learn that **Ragnvald Maartmann-Moe** has been named manager of manufacturing engineering for Raytheon Company's Equipment Division plant at North Dighton, Mass.

A new publication for the Navy by **R. W. Austin** of the University of California at San Diego describes a pair of back to back underwater cameras with 180° field of view lenses for underwater photography to determine values of underwater radiation. . . . A postcard and a copy of a letter from **Lou Rosenblum** report that he has been travelling in India, Israel and other areas last summer. He visited with **Nanu Amin** in Baroda and saw hydro electric generators developed by Jyoti Limited, of which company Nanu is Board Chairman (see photo next page). Lou apparently had a copy of the Alumni Directory with him and undoubtedly saw M.I.T. friends in India and in other places along the way. Look for a longer report on Lou's travels in our next issue. Till then, let's hear from some of you.—**Ken Rosett**, Secretary, 191 Albemarle Rd., White Plains, N.Y. 10605

## 44

This month's news is in three parts: a brief summary of the Class of 1944 at the Alumni Officers' Conference at the Institute; news of the professional advancement of classmates; and address changes showing organizational affiliation.

On September 5, as part of the Alumni Officers' Conference, John Hull convened a session of our own officers and class members who were in attendance. These included Burt Bromfield, Vice President, Paul Robinson, Treasurer, Norm Sebell, ex-Reunion Gift Chairman, Al Picardi, Pete Quattrochi, and Mal Kispert. Burt tentatively accepted the Chairmanship of the 30th reunion and four names were submitted as candidates for Class Agent to Ken Brock, Director of the M.I.T. Alumni Fund. A happy note was recorded for the 25th reunion—we ended up with a "profit" of about



\$3,000 in spite of the lower-than-anticipated attendance. It seems that the reunioners did not consume anywhere near the quantity of liquor that had been expected.

As part of the Alumni Officers' Conference, there were seven panel discussions with participation from the faculty, the students, and the alumni. These proved to be lively, unstructured events with the Class of 1944 holding their own according to Paul Robinson. In addition, Al Picardi attended the Alumni Seminar on Technology and Medicine. He was impressed with the depth M.I.T. has regarding life sciences research and medical device technology. Arrangements are to be formalized with Harvard and Massachusetts General Hospital for continued cooperation. There were 15 premed seniors this year.

I want to commend **Alphose A. Corona, Jr.**, for taking advantage of the Alumni

Fund envelopes to drop us a note. The Institute has a good system for relaying the information to the secretaries. It seems he missed the reunion since he "happened to be in Turkey at the time." You are forgiven Al—we should be so lucky! He also complimented the Reunion Book Committee (under the leadership of Stan Warshaw.) For those of you who have not received a copy of this volume of resumes and photos of classmates, I'll make a deal with you: You send me some information about yourself and family (preferably a resume and photograph so we can have a complete list of biographies) and I'll see that you get a copy of the Red Book. Payment of the class dues of \$25 is guaranteed to expedite delivery.

Members of the Class continue to infiltrate other universities. Boston College has announced that Professor **Richard B. Maffei** is newly appointed Associate Dean of the Graduate School of Business Ad-

ministration. Dick had been teaching Management Information Systems at B.C. since 1967 after teaching at Dartmouth, M.I.T. and the University of Pennsylvania. He was a Course XV man at Tech and received his M.B.A. and Ph.D. from the University of Pennsylvania. The professor has published a number of articles in professional and business journals on advertising effectiveness, management of corporate capital, sensitivity analysis and management decision rules, and on competition, mergers, and market sharing. He resides at Davis Rd., Marblehead, Mass., with his wife and five children.

At Pennsylvania State University, **Lee C. Eagleton**, has been named Professor of Chemical Engineering and Head of the Department. Lee has S.B. and S.M. degrees from Tech in chemical engineering and received his D.Eng. from Yale where he held a National Research Corporation fellowship. Subsequently he did research at Columbia and Stanford. He was a development engineer at Rohm and Haas, Philadelphia, and joined the University of Pennsylvania faculty in 1956. Besides being author of 11 professional papers he has been active in the American Institute of Chemical Engineers and other societies.

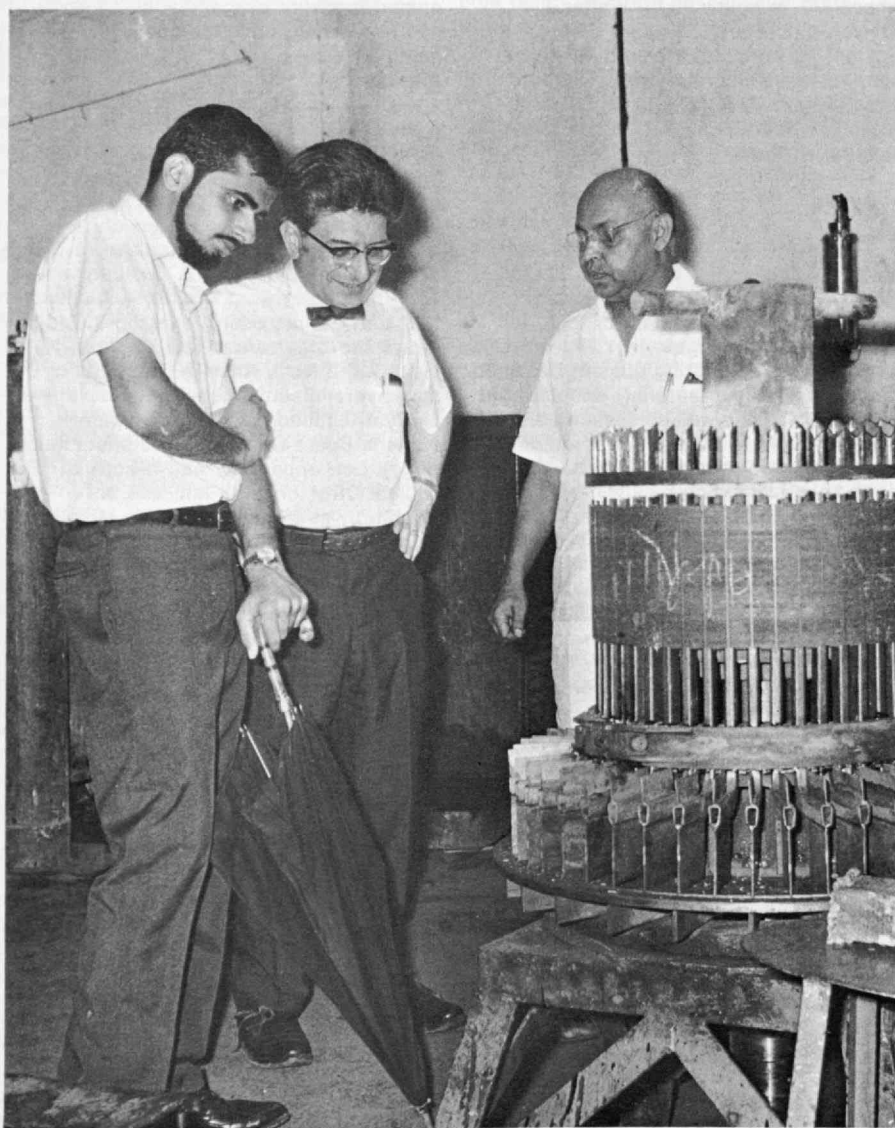
I want you to know that you have a true-blue classmate in **Paul Heilman**. He works for Brass Company A and sent me a clipping sponsored by Brass Company B, his competitor. The ad featured **A. B. Porson** of our Class, a specialist in "the pursuit of quality in fashioning man's oldest metal." Al is the Manufacturing Vice President and appeared to be as handsome as ever in the photograph.

Now a few addresses which indicate some of the company affiliations of our members. These changes of address are alphabetically listed: Dr. Robert D. Arnold (PH), Box 360, NSA Gaeta Det., FPO, New York, N.Y. 09522 (now all you have to do is figure out what "NSA Gaeta Det" is); Frank J. Huddleston (EE), is with MITRE at Headquarters E.U.C.O.M., A.P.O. New York, N.Y. 09128; To pick a domestic address, Stanley Skelskie (LI), is with Quick Frozen Foods, Inc., 1776 Broadway, New York, N.Y. 10019; finally, Egon A. von Reutter (GE), is at Durerstrasse 13, 2 Hamburg, Federated Republic of Germany, naturally.—**John G. Barmby**, Secretary, IITRI, 1825 K St. NW, Washington, D.C. 20006

## 45

Your 25th reunion will be a booming success if the enthusiasm and interest of your Reunion Committee are at all indicative of things to come. I attended the Committee's early September meeting at Boston's 1800 Restaurant and it was a joy to behold the interest of the wives. If these girls have their say—and we all know they will—beware!

There are many of you receiving the *Technology Review* for the first time in



In the electric rotating machine shop of Jyoti Limited in Baroda, India, Nanu B. Amin, '42 (right), Chairman of Jyoti, Louis Rosenblum, '42 (center), and Ashish J. Mehta, son of Jayant J. Mehta, '39, examine a rotor for a sugar centrifuge motor. Managing Director of Indian Petro Chemicals Corporation, Jayant Mehta has served as president of the M.I.T. Alumni Association of Bombay.



many years as a monthly reminder of your affiliation with the Institute and the Class of 1945. If the *Review* and reunion mailings kindle the interest of only a few, our collective interests will have been served. Reunion Committee mailings will keep you more abreast of reunion plans than these notes; on the other hand, we shall be able to report regularly on expected attendees and to provide you with glimpses of the biographical data to appear in the 25-Year Reunion Book to be compiled and edited by **Bob Maglathlin**.

This year's Alumni Officers' Conference was another worthy effort of both the Institute and the Alumni Association. Forty-fivers in attendance were Dave Trageser, Bob Maglathlin, Jim Levitan and yours truly. **Jim Levitan**, a New York City attorney, has been active in Fund activities in our home town, Stamford, Conn.

**Alan Mencher**, Scientific Attaché at the Embassy in London, has agreed to help revitalize the local M.I.T. Club. . . .

**George M. Armstrong** reports that he married S. Patricia Gable on June 28 and further states that it was the best thing he ever did! N.A.S.A. reports that George, who is employed by Honeywell's Livingston Electronic Lab in Montgomeryville, Pa., recently did considerable research and development work on a low temperature battery; i.e. a battery capable of operating in the range 20°C. to -90°C. . . . **William K. Linvill** of Stamford University served on a committee that prepared this past summer a treatise for the National Academy of Sciences, *The Impact of Science and Technology on Regional Economic Development*.

We wish you all a Happy Holiday Season. —**C. H. Springer**, Secretary, MFB Mutual Insurance Company, 420 Lexington Ave., New York, N.Y. 10017

## 47

A nice heavy rain shower has given me a respite from my labors. We are having an addition put on the house but are doing a few odds and ends ourselves. The odds and ends are keeping us off the golf course and certainly have us sleeping well. Betsy and Bill Maley, '48, spent a night with us several weeks ago and can attest to the chaos. While I have this break I had better write these notes before they are forgotten in the effort to lay a patio.

Many of you have taken the opportunity to write a few words on the flap of your Alumni Fund contribution envelope. Thanks from Jack Rizika and Dick Mooney for the contributions and thanks from me for the notes. The space allowed on the envelope is rather small and leaves me with a rather piqued interest. For example Mrs. **Virginia Grammer** advises that she will start her third year of teaching 5th and 6th grade science in the Rochester, N.Y., school system using E.S.S. materials developed

under the auspices of a group from M.I.T. She is also on the board of the Girl Scout Council and is keeping busy with Charles, 14, in the 9th grade and others lost under the glue on the envelope. Virginia, at the top of the note, suggests that maybe she had better write a letter as she was writing under the glue. Virginia if we are to know about Charles' brothers and sisters you had better write.

**Sears Coker** had a similar problem. He writes that he is in Arlington, Va., as an operator analyst, Systems Sciences Division for Technical Operations Inc. His work primarily involves qualitative assessment of emerging technologies in mobility systems support resources for the Joint Chiefs of Staff. Part of his envelope is mutilated but he appears unhappy with some treatment of Walt Rostow. Sears you too will have to write if you want clarification.

The rest are quite concise and straightforward. Commander **Robert Athow** has retired from the navy and is now a design engineer at Boeing in Kent, Washington. . . . Rear Admiral **Robert McNitt** who received an advanced degree with us is Superintendent of the Naval Postgraduate School in Monterey. He went to that post from a N.A.T.O. assignment on Malta and prior to that was commander of a destroyer flotilla in Norfolk. . . .

**Ray Kaplan** is engineering manager of the Kearfott Division Singer Kearfott in Little Falls, N.J. . . . **Howard Adam** is manager of research and development of the process machinery division of Nordberg Manufacturing Co., in Milwaukee. . . . **Beatrice Worsley** is an associate professor in the department of computing and information science at Queens University Kingston, Ontario or as she phrases it "in the 1000 island country." Her other activities center around the computing society of Canada.

That's all until next month.—Let's hear from you.—**Dick O'Donnell**, Secretary, 28516 Lincoln Rd., Bay Village, Ohio 44140

## 49

In my haste to get our class notes into the October/November Issue, I neglected to report the results of the class election held in Bermuda at our 20th reunion. It gives me pleasure to do so now: President, Stanley V. Margolin; Vice Presidents (in alphabetical order), Fletcher Eaton, Archie H. Harris 3d, Charles W. Holzwarth, John W. Kunstadter, and John C. Miller; Treasurer, Paul E. Weamer; Secretary, Frank T. Hulswit; Class Agent, E. Milton Bevington; and 25th Reunion Gift Chairman, Ira Dyer.

True to form, one of our class officers departed for foreign soil shortly after election. Pending an audit, we can only say we are morally certain that **Paul Weamer** did not abscond with the class funds. Paul writes that "Estancia Weamer" is Pueyrredon 1326, Martinez, Pcia. de

Buenos Aires, Argentina. Telephone: 792-4116. ". . . the damndest house, four bedrooms and four baths, guest bath, room for six servants with two baths, summer house and small swimming pool—and the house is one floor and rambles all over the property. It's strange, but we love it here—incidentally, we don't have six servants, only one, but she has two children and a husband." Paul is in Argentina for six months to a year on a consulting assignment, I believe dealing with the use of lightweight aggregates in building construction. Paul Weamer's plaintive postscript in his change-of-address letter to Stan Margolin: "P.S. What are the class finances?" demonstrates a major problem in the once-every-five-year shift of class officers. In taking over from Fletcher Eaton as Class Secretary, I find I have a fairly extensive data organization problem to solve before I can be comfortable that I have the job under control. Until then, it is possible, or even probable, that the class notes will contain some items duplicating events already reported.

In early September, I attended the M.I.T. Alumni Officers' Conference and the first formal meeting of class secretaries held in nearly half a century, which preceded it. Both meetings focused on people and their problems understanding and communicating with one another. For me, today's happenings and concerns at M.I.T. are now very real. I was surprised and somewhat dismayed by the unbelievable range and heterogeneity of viewpoint and belief represented by the conference attendees. Clearly, M.I.T. students, staff and alumni are not in any sense homogenized or brainwashed by their experience at the Institute.

The conference seemed to me to be a good scene. Everyone there, from the most moss-backed alumnus to the bearded student activist, showed evidence of great concern for and commitment to the growth and survival of the M.I.T. community, and this should bode at least middling well for the future. Thirteen classmates attended the A.O.C. On the committee this year and also serving as panel moderators were Russ Cox and Bill Howlett. John Barriger also moderated a panel and will serve on next year's A.O.C. committee. Len Newton was a panel member and John Alger, Ira Dyer, Fletcher Eaton, Frank Hulswit, Harry Koretsky, Stan Margoline, George Piness, Herb Spivak and Kemon Taschioglou all attended. The Eaton, Hulswit and Taschioglou spouses also attended some or all of the conference events.

**Dave Hardin** wrote a letter to Fletcher Eaton which was passed along to me at the A.O.C. I heartily support Dave's implicit tribute to Fletcher's class notes over the past five years: "Reading your Class Notes with fascination finally created an overwhelming desire in me to take advantage of your articulate presentations. Here are a few notes, presented in order of importance. I hope they reach you in a quiet time with your column. 1. We had our third daughter, Amy Elizabeth, in

December, 1968, after a ten-year hiatus. It's like raising another generation—a lot of fun. 2. The company I joined in 1950 [and of which Dave is now President—F.T.H.], Market Facts, Inc., went public on April 29, 1969. When I joined, it had five employees and was doing less than \$100,000 in business. At the time of going public, we were doing a volume of about \$7 million, with 300 employees. It shows you how it helps to join a growth industry."

**John Barriger** sends a note via the Alumni Fund to say that he has moved to Wayland and is now working for Sylvania as Manager, Transportation Control Systems. Because of some confusion between John and his father, the note got to me via the illustrious Secretary of the Class of '21, known to a surprising number of *Technology Review* readers as "Cac."

A news clipping reports that **Joe Schneider**, President of Joseph Schneider Engineers, Inc., a consulting engineering firm in Boston, has been appointed Associate Professor of Architectural Technology at the Harvard University Graduate School of Design, Department of Architecture. Congratulations, Joe.

A March news release informs us that **Lars O. Soderberg** has been appointed as Project Manager for Sherway Mall near Toronto, Canada, by the Rouse Company, a Baltimore-based mortgage banking, real estate and development firm, a pioneer in the design, development and operation of shopping centers in the United States. Lars had formerly been with the Raymond International Corporation, and more recently, has been a resident construction manager and a project manager for the M. W. Kellogg Company, both of New York City.

A July news release names **Louis G. Peloubet** as an Assistant Controller of Allied Chemical Corporation. Lou will be located in New York and will have primary responsibility for direction of the corporate accounting staff and development of accounting policy. He was formerly Assistant Controller of Mobil Oil Corporation's North American Division.

The next news item on my agenda is the Class of '49 statistics, derived from the questionnaire sent around earlier this year. All things considered, I think I'll leave this report for next month's issue, thus putting it a full year out of date. Season's Greetings to all.—**Frank T. Hulswit**, Secretary, 77 Temple Rd., Concord, Mass. 01742

# 50

**Oswald Honkalahto** of the Colgate faculty has been promoted to Associate Professor. He joined the Colgate faculty in 1962 and in 1968 was awarded a Colgate Research Council grant for summer research in the pure theory of production. During the fall semester of the current

academic year he headed the Economics Study Group which studied in England from September through January.

**John M. Hetherington** is currently with the firm of Fugard Orth & Associates, Inc., with offices in Chicago and Clarendon Hills. Their business is mostly with schools and other institutional type buildings. An addition to his house is under construction with John and his family doing some of the work. He is looking forward to the 20th reunion in 1970 and would be pleased to help contact Course IV-A grads about attending.

The National Science Foundation and the Department of State announced that **Joseph Penzien** was one of 27 American scientists, of 64 applicants, to be awarded a North Atlantic Treaty Organization Senior Foreign Fellowship in Science. These scientists will study new scientific techniques and developments abroad under a program designed to foster interchange of information among the member nations of N.A.T.O. With the cooperation of the Department of State, the National Science Foundation administers the fellowship program for United States citizens. Mr. Penzien lives in Lafayette, Calif. and his Fellowship Institution will be the National Civil Engineering Laboratories, Lisbon, Portugal.

**Lowell S. Bensky** has been appointed Vice President in charge of the new offices of Compata, Inc., a California-based computer consultant firm, opening offices at 1 Militia Drive in Lexington, Mass., to serve the New England, New York and Middle Atlantic areas. Mr. Bensky lives in Lexington, Mass., with his wife and three children.

**E. Michael Gyorgy** is a member of the Inorganic Chemical Research and Development Department at Bell Telephone Laboratories, Murray Hill, N.J. He is currently involved in work on the optical properties of magnetic materials. Mr. Gyorgy joined Bell Laboratories in 1953. He initially was engaged in work on microwave devices and later turned to ferrite memory studies. Since 1957 he has been concerned with magnetic materials.

**John F. McCarthy** has joined the Los Angeles Division of the North American Rockwell Corporation as Executive Vice President. Before joining this Division, Mr. McCarthy headed the Research and Engineering for N.A.A.D. as a Vice President, a position he will retain in an acting capacity in addition to his new post.—**John T. McKenna, Jr.**, Secretary, 2 Francis Kelley Road, Bedford, Mass. 01730

# 51

The president of Birch-Mont, Inc., institutional builders, doing approximately one million dollars worth of construction per year is **Ken Bjork**. He and Berdena have three children: Kristine is 17, Larry is 16, and Greg is 7. They live in Oakland, New Jersey.

Suzanne and **Sid Brenner** are living in Monroeville, Pa., and have three daughters: the oldest, Judy, is 15, Cindy is 13 and the youngest, Ellen, is 9. Sid is with U.S. Steel research labs working in field-ion microscopy which Sid describes as "lots of fun." In his spare time, and he has very little, he plays bridge, tennis and reads. I might comment that Sid has established a world-wide reputation for his work on metal fibers, and especially on the very small ones classified as whiskers. There has been much speculation as to the potential value of whiskers as a basis for composite materials because, under certain conditions, whiskers exhibit almost theoretical strengths of the metal. Sid pioneered much of this work.

I have an early and unconfirmed report that **Jack Carpenter** has left American Science and Engineering in Cambridge to join the ranks of the entrepreneurs. He has started his own company, and as soon as I receive some confirmation and details I'll pass them along.

**Fred Ezekiel** was the moderator at a special A.S.M.E. meeting in Cambridge; the subject was "Fluidics" a field in which Fred enjoys an extensive reputation. Fred is a consultant, lives in Lexington, Mass., and he and Bessie have two children.

Professor **George Field** is at Berkeley, in the astronomy department. His activities include examination of the formation of galaxies, intergalactic matter, and hydrodynamics of interstellar matter. He is a member of the N.A.S.A. Astronomy Mission Board and is chairman of the N.S.F. Advisory Panel on Astronomy.

**John Degnan** is a stockbroker with the firm of Francis I. du Pont & Co., in Ft. Lauderdale, Fla. He and Julie have three children and "enjoy all-year-round ocean swimming."

Professor **Myron (Mike) Hoffman** left M.I.T. to join the ranks at the University of California at Davis. Mike had been in the Department of Aeronautics at Tech and is now a professor in the mechanical engineering department at Davis. His field, however, is still aerospace systems design. He and Sharna have two young children. . . . **Windsor Hunter** is a partner in Genex, a new firm in the Lowell, Mass., area. The company is engaged in the manufacture of precision electronic connectors and packaging systems. He and his two partners had been with Transatron prior to the formation of Genex. . . . **Peter Keller** is with Syntech Corporation in Waltham, Mass., an entrepreneurial venture. Pete had been with Dynamics Research prior to striking out on his own.

The **Hugh Knipmeyers** and Hal Siegels should get together: Hugh and Mary Jane Knipmeyer have two sets of twins, ages 13 and 10. Hugh received a Ph.D. from the University of Illinois in 1957 and joined du Pont. He has been with du Pont in various capacities since 1957, lived in Wilmington, Buffalo, and now Circleville, Ohio, where he has been appointed Re-



search Manager for the Circleville R & D Lab. He claims his family leads a typical life: busy with Scouts, bridge (life master), and just discovered golf. He adds one really timely note: "See you at the 20th reunion."

When **Al Larsen's** father passed away in 1961, Al left Raytheon to take over the family business. Al felt that he ought to try it to see how his engineering know how could be put to use in the graphic arts field. Not too long ago there was a feature article in a local paper telling of the A. L. Larsen Company's move to new and larger quarters. This marks an especially large growth for the company—the previous move was reported in this column two years ago, and at that time the company was undergoing significant expansion. Al says that "our aim is to build a team; the reason for our progress is our team spirit within the company." The article says that the company's success is also attributable to reputation for quality service.

At the Alumni Officers' Conference at M.I.T. this September, '51 was well represented. **Gregor Gentleman** came in from Des Moines. He is a principal in the firm of Swanson, Gentleman Inc.; their field is building materials. Greg and Julia have three girls and two boys ranging in ages from 14 to 4. They have been in Des Moines since 1956. . . . A more recent arrival in the Hawkeye State, **Forest Monkman**, was also at the A.O.C. Monk was recently appointed President and General Manager of Parsons, Division of Koehring Co., in Newton, Iowa. Parsons manufactures a line of construction equipment: trenchers, backhoes, heavy off-highway trucks, etc. Newton is the town in which ex-heavyweight champ Rocky Marciano lost his life when his small plane crashed. Monk said the accident occurred only a mile or so from his house. . . . Evie and **George Siefert** came up to Cambridge for the conference, also. They are still enjoying the Connecticut shore (Groton), and George is with Electric Boat. Evie just received her bachelor's degree from the University of Rhode Island which in itself is worthy of mention, but she did it under an additional handicap—the Siefert's went skiing two winters ago and Evie and her skis had a misunderstanding which resulted in Evie being laid up for a while, and even now, almost two years later, she still has a brace on her left leg. . . . Other '51ers at the A.O.C. were Donna and Chuck Hieken, Fred and Betty Ann Lehmann and your secretary.

**John Magee** has been named Executive Vice President and a director of Arthur D. Little in Cambridge. . . . Professor **Joseph Pagano** is at Bridgewater State College, Bridgewater, Mass., in the chemistry department. . . . **Bill Ramsey** has been at Sanders Associates for three plus years and is currently manager for a tactical radar system being developed for the U.S. Army. He and Charlotte have been living in Newton, Mass for the last eight years. . . . **Don Reis**, at Grumman, Beth Page, N.Y., has been hard at work on the

Apollos: 9, 10, and 11. . . . **Bob Wedan** has been moving up the ladder rapidly at N.A.S.A. in Cambridge, Mass.; he now heads the guidance and controls programs.

**Herb Voelcker** has received the University of Rochester 8th annual Curtis award for excellence in undergraduate teaching. The President of the University said: "Prof. Voelcker is a classic example of a scientist-teacher who is dedicated to both his subject matter and his students." In 1963-1964 he was one of the first two faculty members who lived in the then new Towers residence halls on the campus. He and his family "devoted themselves on a 24-hour-a-day basis to working with students," according to one of his colleagues. A specialist in communication theory, Herb joined the university faculty in 1961 after serving as a lecturer at the Imperial College of Science and Technology of the University of London. He is a former Fulbright Fellow and was a member of the 1956 U. S. Olympic Riflery Team. . . . Seasons Greetings and WRITE!—**Howard L. Livingston**, Secretary, 358 Emerson Rd., Lexington, Mass. 02173; Assistant Secretaries: **Paul Smith**, 11 Old Farm Rd., North Caldwell, N.J. 07006; **Walter O. Davis**, 346 Forest Ave., Brockton, Mass. 02401; **Marshall Alper**, 1130 Coronet Ave., Pasadena, Calif. 91107

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Many have already received a copy of the results from the recent class questionnaire, but the highlights are as follows (based on a response from 20% of the Class):

62% of the Class have advanced degrees and 70% of the Class are following their M.I.T. training; 80% say they would send their children to Tech, and 90% say that M.I.T. has fulfilled their expectations; 90% also say they are satisfied in their careers (are these the same 90% as above?); median salary level is \$19,500; average salary \$21,500; and 40% of the Class expect to make \$30,000 within the next five to ten years.

Average net worth of the class is \$115,000—about equal to the average value of life insurance of \$100,000. (We should assume, I suppose, that the \$115,000 is independent of the \$100,000, but in my own case. . . .) Two men (of the 20% sample) are millionaires; 22% are corporate officers; 17% own their own business; and another 10% plan to start their own businesses soon.

Regarding nonprofessional pursuits: 90% are married; 10% are divorced. The wise men that have never married, therefore, could range from 0-10%; the statistics are not clear on this point. One man supports a mistress as well as a wife. It seems quite clear that not everybody was fully straight on this point, because there are two and not one millionaires and even a poor guy making only a hundred grand per year could afford . . .

In keeping with **Paul Shepard's** hope that our class can pursue life in such a way as to improve the welfare and general environment of others as well as ourselves, I am sure many of our classmates are doing this in one way or another. . . . **Dave Berkowitz**, of MITRE Corporation, Bedford, Mass., has recently been appointed Executive Secretary of the American Association for the Advancement of Sciences Committee on Environmental Alteration. . . . Similarly, **Elmo Pacini** was recently President of the Institute of Environmental Sciences Mount Prospect, Ill. . . . In a somewhat more earthy vein, **B. J. Kelly** has contributed in the area of cooling tower waste disposal. . . . And finally, **Bruce Beckley** and his wife have been very active in Audubon Society work. Bruce is a project engineer at the Yankee Atomic Electric Company, Nuclear Power Project in Maine and he and his wife direct the wildlife Sanctuary of the Audubon Society in their area. They live on the property and care for it as a full-time spare-time pursuit.

**Sven Treitel** is now a research group supervisor of Pan American Petroleum Corporation in Tulsa. Sven recently attended a European Geophysicist Conference in Venice, Italy. . . . **Donald MacKillop** was recently appointed Associate Actuary for the Traveler's Insurance Company, Hartford, Conn. . . . **Jim Klupar** is now Professional Services Manager of a new B. F. Goodrich Chemical Company plant at Pedricktown, N.J. Jim has been with Goodrich since graduation from M.I.T. He and his family live in Lewiston Heights, N.Y. . . . **Charles Rabkin** is now Industrial Relations Manager for American Cyanamid Company, Wallingford, Conn.

**Andrew Lemnios** and **John Calligros**, both of the Class of '53 were roommates at M.I.T. and were later best men at each other's weddings. They now work in the same company, Kaman Corporation, and were both recently promoted to higher positions—Lemnios is now Chief Research Engineer of Kaman's Aerospace Division in Bloomfield, Conn., and Calligros is now Senior Scientist for Kaman's Avadyne Division in Burlington, Mass. Both men were recently honored as Associate Fellows of the American Institute of Aeronautics and Astronautics.

Back to the Class's interest in environmental management—it appears we have several individuals active in the architectural and design profession. **Salem Shaheen** was recently named an Associate of the Perkins & Will Partnership, an architectural firm. Perkins & Will has a national practice in health, education, and urban development projects as well as commercial and industrial activities. . . . **Steve Kliment** recently joined Caudill Rowlett Scott, Architects, Planners & Engineers as architect in charge of Research and Information, a new post with that company. Formerly, Steve was editor of *Architectural and Engineering News* (1961-1969). Steve is now living in New York City (501 East 79th St.). . . . Also, we





L. S. Bensky, '50



D. A. Berkowitz, '53



F. J. Heymann, '53



S. Treitel, '53



G. A. Wallace, '53



R. M. d'Oliveira, '54

must keep in mind that **Marty Wohl**, formerly with Rand Corporation, is continuing his activities in the environmental area in the Nation's Capitol. We do not know what Marty's specific assignment is in Washington now, but hope to hear about this soon. Marty lives at 500-23rd St., N.W., in the Columbia Plaza Apartments (number B810).

**George Wallace** was recently named a Director of Marketing for the Ecusta Paper Division of Olin Mathieson. . . . **Frank Heymann** was awarded the Charles E. Dudley Medal by the American Society for Testing and Materials for his work in erosion. . . . **E. Fletcher Hosmer** was recently elected Vice President of the First Boston Corporation in New York, an investment banking firm. . . . **Gene Richter** is now sales manager with National Acme Company. Gene was formerly product manager with TRW. He now lives in Cleveland with his wife, Jennifer, and two daughters. . . . **Jay Berlove** reports that he now has a second son, Noah. . . . **F. Patterson Smith** reports that he now has five sons and is engineering manager at the Radon Subsidiary of Microphase Corporation.

According to the change of address records, Norman Garnder recently moved from New York City to Red Bank, N.J. (Riverview Towers). Some of his classmates who live in distant places and who had recent changes of address are: Brandon Rigney, Jr., 5820 Martita Ave., Las Vegas; Raul Bachman deRutte, Bogotá, Colombia; Charles Terry of Terry-Rosenlund & Company in Dallas, Texas (2818 Maple Ave.); Carl Schroeder, Scottsdale, Ariz. (8002 North Ironwood Dr.); Alex Danzburger, Sperry & Hutchinson Company, 330 Madison Ave., New York; Arthur Poynton, Guildford Surrey, England; Lieutenant Colonel Charles Frederiksen (recently promoted from the rank of Major), APO New York, 09131; Khoo K. Ng, Penang, Malaysia; George Stuart, Jr., now lives at Rancho Sante Fe, Calif. 92067; Dave Hindman, Houston, Texas (P. O. Box 58373); Frank Jarman (continues at Genesco Inc.), 111 Seventh Avenue, North, Nashville, Tenn.; Jim Hurst, Lookout Mountain, Tenn. (113 Hooker St.); Robert Blickley now lives in Washington, D.C. at 1707 Columbia Rd. Northwest; Rocco Mancini, Transportation Consultant, City of Honolulu, Hawaii;

John Klinger, Jr., Tulsa, Okla. (P. O. Box 3107); Ben Sack, 797 Lakemont Dr., Mount Lebanon, Pa.; Don Fischer, Centerport, N.Y., at 26 Harbor Ridge Dr.; George Fuld, Cherry Hill, N.J. at 1001 North Kings Highway.

On the educational front, a number of classmates have shifted their teaching activities either in location or in position. **G. Alvin Pierce** who received his Ph.D. in astro and aeronautical engineering at Ohio State in 1966 is now teaching at Georgia Tech in Atlanta as an associate professor. Alvin's wife is also an engineer. . . . **Joseph Casanova** was recently promoted to professor of chemistry at California State College, Los Angeles. . . . **Walter Hollister** is now associate professor at M.I.T. in the Department of Aeronautics and Astronautics. Walter has been very active in planning future space efforts and in the consideration of the type of future missions that should be considered for interplanetary research. . . . **Jack Dennis** has recently been promoted to full professor at M.I.T. in the electrical engineering department. . . . **Kent Hansen** is now a full professor at M.I.T. in nuclear engineering. . . . **Whitman Richards** is now an associate professor at M.I.T. in the Department of Psychology. . . . **John Mathis** is now professor of astronomy at the University of Wisconsin. . . . In the medical area, Dr. **William Floyd** was one of several physicians who developed an improved test for early detection of cancer. Dr. Floyd has helped develop a simple, reliable, safe and inexpensive test for cancer in women's reproductive systems. . . . Finally, a note about **Milton J. Muss** and his wife, Gertrude. Milton is township engineer in the Township of North Bergen, N. J. and both he and his wife are actively involved in town planning and education.—**M. C. Mander-son**, Secretary, Longley Rd., Groton, Mass. 01450

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**Richard Hayes**, director of technical programs at the N.A.S.A. Electronic Research Center in Cambridge, is serving on N.A.T.O.'s advisory group for aerospace R and D. . . . **Charles Krakauer** is president of Acton Laboratories, Inc., a Bowman subsidiary located in Acton,

Mass. . . . **Charles Shaw** has been elected a principal of McKinsey and Company, Inc., international management consultants. Since joining the firm in 1965, he has served client organizations in this country and overseas on problems of strategic and financial planning. . . . **R. M. d'Oliveira** has been named plant manager of Southwire Company's Rod and Cable Mill in Hancock County, Ky. He holds the rank of Commander in the U.S. Naval Reserve and was serving as Maintenance Officer for US 2722, a Naval Air Reserve anti-submarine squadron in South Weymouth, Mass. The d'Oliveiras have three boys and three girls.

**C. C. Leiby** of the Air Force Cambridge Research Center has brought a new perspective to the search for the relationship between electro-magnets and gravitational forces. His theory, which has evolved over the past two years, was published last spring in an A.F.C.R.C. report *Gravity and Electric Charge*. . . . **David Chesler's** wife, Bernice, has written a revised edition to her very complete travelguide to the Boston area, *In and Out of Boston with Children*, a comprehensive compilation of places to see and things to do with practical details including visiting hours, fees, and even the availability of rest rooms. The Chesler's are obviously experienced parents with 11-year-old Mark and 10-year-old twins Stan and Lisa.

**Igor A. Black** is reported by the Alumni Association to have passed away April 20. His address was Prospect Hill Road in Harvard, Mass. We extend to his family the sympathy of the Class.

Classmates who attended Alumni Day last June included Anna Bailey, Wallace Boquist, John Byrnes, Williams Combs, William Gleckman, Arthur Haines, Stanley Hoff, Dean Jacoby, Robert Rohner, Dominick Sama, David Wiesen, William McTigue, Jerome Wayne, and Hugo Belalcazar.

Here are the first of the reunion tidbits from Bob Warshawer. Attendees at the June 13-15 Berkshire blast were: Vic and Elaine Ellins, Sharon, Mass.; John and Jane Prohaska, Marblehead, Mass.; Tom and Ruth-Allison Bastis, Mora, Minn.; Lou and Marie Mahoney, Stoneham,

Mass.; George and Sydel Dormer, New York, N.Y.; Chuck and Ruth Masison, Westwood, Mass.; Dick and Pat Lane, Washington, D.C.; Bob and Natalie Warshawer, Lexington, Mass.; Dave and Rosalie Myers, Newton, Mass.; Dean and Eileen Blake, Medford, Mass.; Bob and Ticki Anslow, Manhasset, N.Y.; Harvey and Arline Steinberg, Framingham Centre, Mass.; Bob and Ione White, Westbury, Long Island, N.Y.; Manny Nadler, New York, N.Y.; Mort and Joanne Davis, New York, N.Y.; Ron McKay, Santa Monica, Calif.; Dave and Mrs. Wiesen, Newark, N.J.; Bill and Shari Moody, Hacienda Heights, Calif.; John and Matilda Bradshaw, Roanoke, Va.; Art and Bev Haines, Pittsburgh, Pa.; Larry and Harriet Holmes, Hamden, Conn.; Wally Boquist and son Gregory, Boston, Mass.; Pete and Susan Felsenthal, Lincoln, Mass.; and Ron and Mrs. Kurtz, Westwood, N.J.

Awards for farthest travel went to Ron McKay and to Bill and Shari Moody; for most kids to Charlie and Ruth Masison (six) and Joe and Eileen Blake (five); and for golfing (just for trying) to Charlie Masison and Lou Mahoney.

Entertainment was provided as follows: The "Old Soldiers" (Bob Anslow, Tom Bastis, Lou Mahoney and John Prohaska) presented a musical history of our days at M.I.T. written and directed by Vic Ellins and narrated by Chuck Masison. Wally Boquist was the featured speaker. He spoke about his trip to Siberia to photograph the eclipse. The article he wrote for the *Technology Review* last year (see *Technology Review for March 1969*, pp. 35-41) covered the eclipse itself. From his talk we learned about the people in the international group which conducted the eclipse investigation. It was most interesting.

Just as at all past reunions, it rained Friday night and Sunday. Saturday was wet but sunny enough for outdoor activities. We antiqued in the morning, played tennis, badminton, swam, rode horseback, golfed and had a good time visiting and relaxing until cocktail time. Bob promises more reunion news for future issues.—**E. David Howes, Jr.**, for **George Inada**, Secretary, 6001 Chatsworth Lane, Bethesda, Md. 20014

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If you haven't already heard from the Reunion Committee, you will soon. Even though we may all hate to admit that we're 15 years older than we used to be, we certainly do look forward to getting together in June. Many of us are already actively contacting each other to get the wheels in motion.

**Al Boardman** writes that he is currently Director of the Analysis Program Systems Division of Aerospace Corp. Lina and he are living in Woodland Hills near Los Angeles. . . . **Stan Amstutz** was married to Carolyn Stevens in October of 1966. Their daughter, Jennifer, was born a year ago June. Stan has been at Honeywell Computer Control Division since the beginning of this year. . . . **Gary Brooks** has opened his own management and technical consulting office in Stony Brook, L.I. Gary is very active with the M.I.T. Alumni of Long Island and with the Educational Council. . . . **Bill Chandler** is two-thirds finished with the M.B.A. program at the University of San Francisco "(not the one with the riots)." Unfortunately, graduation from U.S.F. will coincide with our reunion and Bill is now faced with the dilemma of wanting to be in two places at once. Bill, your Class Secretaries are offering a special prize at the reunion for any member of the Class who has an M.B.A. from U.S.F.—the prize can only be received in person. Let us know if U.S.F. makes a counter offer.

Since February 1968, **John Eddison** has been Director of the Office of Near Eastern Affairs for International Development in Washington, D.C. . . . and sometimes engineers think *they* have problems. . . . Sandy and **David Kramer** visited Rome and Vienna in June. In Vienna David delivered a paper on radiation effects in metals at the International Atomic Energy Agency. . . . Ruth and **Lester Lee**, who look forward to attending the reunion, added Jennifer Marni to the family in August of 1968. Les is vice president and secretary of Capitol City Liquors in Washington, D.C. . . . **James Pratt** writes from Roseburg, Ore., that he hopes to be in Boston in October to attend a Hardwood Plywood Manufacturers' Association Meeting. Jim manages a saw mill and ply-

wood complex for the Roseburg Timber Company and is a divisional vice president and member of the board of directors of the Association.

**Dick Rush** writes from Valparaiso, Ind., that he has been transferred to new steel making facilities at Bethlehem's new Burns Harbor, Ind. plant. Dick is active in Boy Scout work and participated on the staff of the National Boy Scout Jamboree in Idaho this past summer. On June 19, he was honored by receiving the Silver Beaver Award from the Boy Scouts of America for outstanding service—quite fitting for a Tech man. . . . We received a letter of announcement of the arrival of Abigail Hannah to Mary Glenn and **Samuel Goldman** in August. They are living in Branford, Conn., where Sandy is Chief Engineer and Technical Director of the Intertech Division of Picker Nuclear Corporation. In April, he presented a paper, *Basic Nuclear Medical Engineering*, to the Connecticut section of the I.E.E.E. in Hartford. Sandy passed along the information that **Mike Horstein** was married to Charlotte Ann Gross in Beverly Hills, Calif. in August.

Remember. . . . **REUNION IN JUNE.**—Secretaries: **Mrs. J. H. Venarde** (Dell Lanier), 16 South Trail, Wilmington, Del. 19803; **L. Dennis Shapiro**, Aerospace Research, Inc., 130 Lincoln St., Boston, Mass. 02135

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Well gang, the 15th reunion, June 1971, will be at the Harbor View Inn in Edgartown, Martha's Vineyard, Mass. After tentative executive committee approval in June, we had several people visit the Inn this summer and confirmed the commitment at the end of August. More information will be forthcoming but we think this is an outstanding opportunity to combine a vacation with a class gathering.

**John Cotter** wrote an article on direct digital control of chemical processes for the May issue of *Chemical Engineering Progress*. John is a consultant in that field with Information General Corporation, Woodland Hills, Calif. . . . **Frank Flaherty** has been made head of the



Power Systems Physical Design Department at Bell Telephone Labs in Whippany, N.J. His assignment is to develop new equipment to bury cables. . . . **Bert Lippel** recently published a report, *Experiments with a New Message Format for Digital Encoding of Pictorial Information*. . . . **Gene Marcus** is manager of guidance engineering for the Sam-D program at Raytheon. Gene and Maxine have two children, Sharon Lee and Gregg David.

**Karl Pearsons** has published *Combination Effects of Tone and Duration Parameters on Perceived Noisiness*. . . . **Harry Pople** received a Ph.D. in industrial administration from Carnegie-Mellon last June. His major was systems and communications sciences. . . . In last spring's *Technique*, **Jack Saloma** conveyed his impression of the changing character of M.I.T., and the evolution of student attitudes. . . . **Gordon Sammis** writes that he is the head of Undersea Systems, Inc., a new firm specializing in ocean engineering and diving. . . . **Howard Trachtenberg** has been appointed Assistant Professor of Anaesthesia at Beth Israel Hospital by Harvard University.—Co-secretaries: **Bruce B. Bredehoft**, 3 Knollwood Dr., Dover, Mass. 02030; **T. Guy Spencer, Jr.**, 73 Church St., Weston, Mass. 02193

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**John Crews** has been appointed assistant to the president of the *Los Angeles Times Mirror*. John joined the *Times Mirror* after leaving the Cahn Division of Ventron Instruments Corporation, Paramount, Calif., where he was vice president and general manager. Previously, he served Litton Industries, Inc., for six years, most recently as director of planning in the Advanced Data Systems Division; and Arthur D. Little, Inc. for three years as an electronics engineer. John received his M.B.A. from the Stanford University Graduate School of Business and has taken graduate courses at the University of California, Los Angeles. John is married to the former Janet Chambers. They have two children, Douglas and Carol; they make their home in the Brentwood area of Los Angeles.

**Frank Salz** is now attending the University of Connecticut Law School. . . . **David Freedman** dropped us the following line: "I recently joined Stop and Shop Inc. (Boston) as director of construction and engineering. I was formerly construction manager for Gilbane Building Company in Boston." . . . **Roger Yaseen** writes that he is working on a book on Japan following a trip through that country. Roger is vice president of the Wine and Food Society of New York and a member of the board of the 92nd Street Y.M.Y.W.H.A.

**Uzal Martz** was elected treasurer of J. H. Zerbey Newspapers Inc., in January of this year and in May was appointed publisher and chief executive officer. Zerbey publishes a 29,000 circulation newspaper, six evenings a week. . . . **Joel Schiffman** writes: "I will become a Fellow of the

American Academy of Orthopaedic surgeons in January 1970 which is the first allowable date for election to the Academy following certification by the American Board of Orthopaedic Surgeons in January 1968. I am continuing to enjoy practice in Alexandria, Va." **John Collins** is Electronic Division Manager of Analog Technology Corp., of Pasadena. The company is engaged in the development of scientific instrumentation for N.A.S.A.

**David Walker** writes: "I will have been married four years in March to the former Sharon Ray. We have three children. Our home is atop the foothills in the Riviera section of Santa Barbara. This August will mark the end of my sixth year as an operations analyst with General Research Corp." . . . **Kenneth Kanrich** writes that he recently set up his own "peanut stand" selling folding cartons and plastic blisters. "I'm also involved in low cost housing development which (we hope) will be America's answer to the urban development problems that plague the nation." . . . **Charles Kadlec** has been appointed General Manager of Stow Laboratories Inc. Charles joined Stow Laboratories in February 1968, and was elected Vice President in March 1969. Prior to that time he had been employed by BLH Electronics, Inc. He resides with his wife, Lesley, and three children in Acton, Mass. Stow Laboratories of Stow, Mass., manufactures and markets a line of unique pressure sensitive transistors called PITRANS for a wide range of transducer applications. . . . And to close here is an interesting story, "Living with MS", **Ken Peterson** sent us. It's from Raytheon's Bedford Laboratory's *Missile Messenger*.

"I now have everything a man could want," says Ken Peterson of the Sentinel Reliability Department, Bedford Annex. Ken should know—he successfully combatted a deadly attack of Multiple Sclerosis—and is now well on his way to recovery. . . . Ken, an M.I.T. graduate, has been with the Bedford Labs since 1965. Although he had symptoms as early as 1960, he was first told he had Multiple Sclerosis in 1966. A leave of absence in early 1967, granted through the efforts of his supervisor, Douglas Eckhart, enabled Ken to learn to live under the shadow of M.S. However, the symptoms continued to get worse.

"From the Multiple Sclerosis Society, Ken obtained the name of Doctor Leo Alexander, an M.S. specialist who employs a unique method of treatment using ACTH to combat the brain-deadening disease. Doctor Alexander noted that many pregnant women with M.S. had a remarkable improvement from the disease. He reasoned that, while pregnant, their bodies produced a variety of hormones with the presumed ability to counteract M.S. When ACTH became available, Doctor Alexander decided to try it. With the collaboration of Doctor Leo Cass, and after initial studies in conjunction with Drs. Peter Forsham and George Thorne, he began to use it successfully against the disease.

"When he contacted Dr. Alexander, Ken could hardly walk, was rapidly losing his sight, and needless to say, was extremely despondent. Without the help and constant encouragement of his wife, Donna, he doubts that he could have survived those difficult days.

"At the Chandler Hovey Unit of the Brooks Hospital in Brookline, Mass., under the care of Dr. Alexander and Dr. Cass, Ken was given ACTH first intravenously, then by intra-muscular injections. In ten days, the man who had been almost helpless could see and move well enough to pick up a dime from the floor of his hospital room. In seven weeks he was released with 20/40 vision in his right eye, 20/100 vision in the left and a firm control of his muscular actions. Today, still on ACTH, he continues to make good progress.

"How does a man face a challenge such as Ken Peterson faced? By faith—faith in God, faith in his doctors and faith in his wife, Donna who was with him all the way."

Please send letters to keep me amused during the long nights ahead.—**Frederick L. Morefield**, Secretary, Tiirasaarentie 17, Lauttasaari, Helsinki 20, Finland

## 59

With the recent "biting-of-the dust" (so to speak) of two of our classmates, the ranks of us '59 bachelors are thinning most noticeably. **Ron Stone** wed the lovely Barbara Ann Zamborsky in an M.I.T. Chapel ceremony last May and spent part of his honeymoon at the 10th reunion at Wentworth-by-the-Sea. Ron has recently been appointed Assistant Director of the M.I.T. Industrial Liaison Office. . . . **Leon Glicksman** wed the lovely Judy Anenias in another M.I.T. Chapel ceremony this past October. The engagement was announced just prior to the reunion weekend where Judy proudly displayed an eye-dazzling diamond. Leon is currently on the staff at M.I.T. as Assistant Professor in the mechanical engineering department.

**Carl Neu** and his charming wife, Carmen, have recently departed the local area for Colorado, where Carl has accepted a management position in the R and D division of the Gates Rubber Co. Prior to his move, Carl served as an Industrial Liaison Officer at the Institute.

On the subject of moving we have a statistic of interest. In the three months since I assumed the duties as class secretary, I have been notified by the Alumni Office of changes of addresses for over 75 of our classmates. Anyone know a good moving company stock to add to my portfolio!

Course III classmate **Ken Kreider** writes that a second son, Christopher was born to join Brett and Cindy. Ken is currently Program Manager, Composite Materials,



at United Aircraft Research Laboratories, Hartford, Conn.

**Bud Long** writes that for the past five and a half years he has been working for Caltex at their laboratory in Holland during which time he travelled and sailed extensively in Europe. He has recently been transferred to Standard Oil Co., of California, and is presently engaged in fuel research and development at the Chevron Research facility in Richmond, Calif. He also relates that his family now includes a son (age five) and a daughter (age three).

**George Barnett** informs me (for the second time) that he has become a director and vice president for membership of the M.I.T.-Long Island Alumni and invites all alumni in the area to join that happy group. He also writes that "recent news from the medical profession indicates my wife will have our second child next April. Any suggestions for names?"

**Bob Jenkins** received his Ph.D. in psychology from the University of Chicago in June 1968. He is presently teaching research design to psychiatric residents at the University of Illinois College of Medicine and to psychology graduate students at the University of Chicago. In his spare time he is writing a book on statistics and psychological research.

It seems that many of our classmates have decided to pursue teaching careers replete with the advantages of the academic environment. Among these are: **Joseph Kubis** who, after spending two years as a research associate in the High Energy Physics Group of the Cavendish Laboratory, University of Cambridge, is now Assistant Professor of Physics at Michigan State University; **Bob Manlove** is Instructor of Geology at City College of San Francisco; **Joseph Johnson** is Assistant Professor of Mathematics at Rutgers University. Joe has been named a Faculty Fellow for the current academic year, and will spend the year in Nice with wife Harriette and daughters, Jennifer, four, and Laurie, two.

**Macie Makowski** writes that he is presently employed at TRW Systems in Redondo Beach, Calif., and states that the years have been good to him and that he, his wife and six fine children are living in lovely Palos Verdes Estates. . . . On the consulting scene, **Bruce Wooden** informs me that he has joined Booz, Allen Applied Research, Inc. . . . **Malcolm Laughlin's** wife writes that Mal is working as a senior consultant with Peat, Marwick, Mitchell and Co. as a Transportation specialist. She also informed me of the birth of their second daughter last August. . . . Other notes from the stork include announcements of a son, Mark Denny, born to Lydia and **Bob McAuliffe** and a daughter, Anne Elizabeth to Betty and **Jim Conklin**.

Well, that's about all the news for now—keep those cards and letters coming. The promised reunion report will come next month, after Al Bufferd completes

his statistics. In closing may I wish you all a Merry Christmas and Happy Holiday Season.—**Art Collias**, Technical Forum Associates, Inc., 545 Technology Square, Cambridge, Mass. 02139

## 60

**Tom Farquhar**, noble Reunion Chairman, reports that he is rounding up a list of all professional society meetings, conventions, etc., in the Boston/New York area for the weeks before and after the Reunion (June 12-14, 1970, remember?). If you know of any obscure—or not so obscure—meetings you think he might have missed, let us know. Hope we'll see you in June.

**John White** says, "My wife Pat and, two sons (John Jr., eight and Jimmy, five) and I are very happy as we enter our seventh month in first house of our own. I continue working for Turner Construction Co., in Manhattan, presently as Engineer/Construction Superintendent."

**Jack Edwards** received his Ph.D. in economics from Harvard in June 1968. Now he is Treasurer of Dynamic Corporate Projections, Inc., and Visual Learning Corporation. For those of us who don't know, Jack says that "D.C.P.I. produces and markets economic forecasts and stock market analyses. V.L.C. produces and markets educational films and film loops." Jack also reports that he has good connections in the venture capital sphere and is helping to finance fledgling enterprises.

**Peter Silverberg** has been at Pratt & Whitney Aircraft since 1965. I'll let Peter speak for himself: "Since 1966 I have been working on reducing the smoke output of jet engines. We are successful but there are so many engines to provide new parts to that it will be 1971 before most people will notice the smoke missing. I have a wife, two kids, and a lawn demanding whatever spare time is left."

**Bill Bisson** dropped in last week. I should use the term "dropped in" advisedly here because Bill has just started skydiving. In fact, he did his darndest to get us up there leaping out of a plane with him, even demonstrating the proper exit technique and assuring me that me that the chutes *always* open. I'm not convinced; I'm not even sure I want to watch a friend of mine fling himself out of a plane. Of course, the fact that I get dizzy on a thick rug may have a little to do with it. Bill got his architecture degree at night school here in Boston and is now working for a Boston firm.

Jerry and **Barbera Stephenson** were in Maine with us for a week this summer. Barbera brought one of her patented Kitchen Calculators with her. It's a circular slide rule kind of device and it converts recipe measurements. For instance, if you want to make one and a half times the recipe, you simply set

the dial and can read your new measurements. Very nice! And also very nice is the Stephensons' more recent news that they are expecting their first child in March.

**Mark Jensen** wrote a long letter and said, among other things "Every time I read the *Technology Review*, I get up tight when I get to the alumni section and read how well my fellow classmates are doing." He then went on to describe a recent period in his life when he wasn't doing very well at all, although he says that now "the story gets better." His remarks got me to wondering—I only report the bright side here. No one ever gets discouraged, sick, even angry. Is that what everyone wants to hear? Think about it and maybe we can discuss it at the reunion.

**Jerry Levine** is now associated with the J. Shapiro Co., as a Registered Representative. He is specializing in local over-the-counter securities, especially those that have technical bases. To quote him, "All and any alumni are invited to call or drop in." (Jerry is in Minneapolis, I think.)

**Charles Hedrick**, who was Assistant Professor of Chemistry at the University of Pennsylvania, is now Analytical Research Chemist with the U.S. Atomic Energy Commission in New Brunswick, N.J. He says that he is married and expecting, and has 14 publications in analytic research to his credit. . . . **Ed Kane** was awarded a John Simon Guggenheim Memorial Fellowship for 1969-1970. . . . **Leonard Youens** now has a staff position with M.I.T.'s Lincoln Laboratory.

I ran into **Al Krigman** in September. He was here for the Alumni Officers' Conference and our paths crossed when I was over at M.I.T. for the Technology and Medicine Seminar. Al is in Philadelphia now, and is the Editor of *Instruments and Control Systems*. Al's card says that *Instruments and Control Systems* is the "leading magazine in the instrument and control field. Editorially directed to engineers with a primary interest in instrumentation (inspection, testing, analysis, computing and control)." Al said that he is really enjoying himself and, in fact, wishes only that he had gotten into this kind of work earlier.

**Ron Agronin** writes that "since my last note I left Champion Papers and have joined Kimberly Clark. It was quite a change moving from Houston, Texas, to Appleton, Wis. My job requires a lot of traveling but unfortunately none in the Boston area. We now have a little girl, Robin, to go with the two boys."

That's all for now, but I've still got news so watch this space. Keep us posted on your whereabouts and we'll see everybody at the reunion.—**Linda G. Sprague**, Secretary, 10 Acorn St., Cambridge, Mass. 02139



S. Harrison, '62



R. P. Popadic, '64

## 62

**John E. Prussing** writes that he had been a postdoctoral fellow at the University of California, San Diego, since he obtained his Sc.D. from M.I.T. in 1967. He has just recently been appointed Assistant Professor of Aeronautical and Astronautical Engineering at the University of Illinois, where his duties will be organizing and teaching a graduate program in orbital mechanics, as well as advising on and conducting research in the area. His wife, Laurel, plans to continue working toward her doctorate in economics; they are buying a house, and look forward to settling with their daughters Heidi and Erica.

**Stanley Harrison** has been named manager of equipment development for KEV Electronics Corporation of Wilmington, Mass. He received his degree in aeronautics and astronautics and was also recipient of the Admiral Luis de Florez award from M.I.T. for "outstanding ingenuity."

**David H. R. Vilkomerson**, a member of the scientific staff of R.C.A. Laboratories, has been awarded a postdoctoral fellowship at Hebrew University in Jerusalem. He has just received his Ph.D. in electrical engineering at Columbia and will spend the 1969-1970 academic year at Hebrew University where he holds dual appointments from the Department of Experimental Physics and the Department of Experimental Medicine and Cancer Research, Hadassah Medical School.

Carnegie Institute of Technology lists **Robert A. Wagner** as a candidate for the doctorate in computer science. . . . Mrs. **Francis Kaye Porter Singleton** called a few weeks ago. She is working toward a Ph.D. at the University of Washington, as was her husband until he recently received a draft call. She mentioned that **Newton Kupelian** is at California State, Long Beach, having completed postdoctoral studies at the University of Washington. She is interested in hearing from other Tech coeds of our Class. Her address is 348 North 84th, Seattle, Wash. 98103.

**Peter P. Goldstein** writes that he was sys-

tems analyst/software support for Los Angeles offices of the Digital Equipment Corporation from September, 1968, through June, 1969. He then went to D.E.C.'s software support administration offices in Maynard, Mass. . . . **John W. Devanney, 3d**, was appointed Assistant Professor of Naval Architecture and Marine Engineering at M.I.T. for two and a half years as of February 1, 1969. . . . On March 1, 1969, **David W. Rumsey** was appointed Assistant to the Director, Continental Region, United Shoe Machinery Corporation (International), 16 Avenue de Valmont, Lausanne, Switzerland. . . . **Joel A. Karp** writes that since September, 1968, he has been working for Intel, a small company dedicated to the furtherance of the state-of-the-art of LSI. Intel is headed by Robert Noyce, Ph.D.'53, formerly with Fairchild Semiconductor.

**Elliott J. Bayly** is now Assistant Professor of Electrical Engineering and doing research in biomedical engineering at Northwestern University. . . . **Harold G. Snyder** is teaching modern mathematics on the junior high school level, primarily for advanced students, and is also doing some experimental farming at home.

**Philip S. Schmidt** wrote that he and his wife, Donna, had recently had a baby boy, Allan Patrick. Phil received his Ph.D. in mechanical engineering from Stanford in September 1968 and is now teaching at Prairie View A and M College on a 2-year Woodrow Wilson Internship in mechanical engineering. Phil feels that it is a great experience and wants to encourage classmates who would be interested in teaching at a predominantly Negro college. . . . **John V. Terrey**, who received S.M.'s in electrical engineering and in management from M.I.T., June, 1968, is now back at Raytheon Company's corporate offices, working for the Director of Corporate Planning as a planning analyst. Their second child was born September 27, 1968, and they also have a three-year-old girl.—**Gerald L. Katell**, Secretary, 310 Hoge Building, Seattle, Wash. 98104

## 64

The heat of August flushed several classmates out of their long silence and

caused them to become Class Heroes by writing of their activities.

**Pete Angevine** has been working for Dorr-Oliver, Inc., a chemical engineering and equipment business, since graduation. He is a group leader in charge of their fluid bed development laboratory. In September he took off for Bombay to work on a company project there. Pete, a bachelor, is living in upper Westchester County; he notes that **John Reed** has received his Ph.D. from Columbia, and is now a professor in the department of sociology at the University of North Carolina. Also, he occasionally sees **Marty Ormond** in New York, though he doesn't give a permanent whereabouts.

**Lance Bosart** writes that he received his Ph.D. in meteorology at M.I.T. this past June, and that he is now an assistant professor in the Department of Atmospheric Science at the State University of New York in Albany. He was married to Miss Helen Haskell on June 28 of this year; Helen is teaching mathematics at a local high school. Lance states that **Marvin Geller** also received his Ph.D. in June from the same department. Marvin is now an assistant professor in the physics department at the University of Illinois.

**Ron Cordover**, while not writing a letter, earned his Class Hero status by calling me all the way from Fun City to say hello. Ron has founded his own company, called Scientific Applications, Inc., headquartered on the Avenue of the Americas. The company is in the venture capital and scientific consulting field, with special emphasis on investing in young and energetic science-oriented firms. As president and chairman of the board, he has created an association with an established investment banker, giving his company over one hundred million dollars to invest in promising enterprises. While Ron is out struggling with the bulls and the bears, his wife Barbara and daughter Valerie enjoy a less hectic life at home.

**Steve Glassman** writes that he took the New York bar exams, and then went to Europe for R&R. He promises to forward to me any promising pictures from his photographic efforts at the reunion. . . . **Doug McCallum** is a lecturer in the de-





Captain Michael L. Coleman, '64, and wife Patricia

partment of town and regional planning at the University of Glasgow in merry old Scotland. He reports that he is the first McCallum of his branch of the family to live in Scotland since the 18th century. Doug and his wife Janice have a large flat in Glasgow, and all friends are cordially invited. . . . **Herb Norton** received his Ph.D. in physics at Columbia, and rewarded himself with a three-week tour of Europe. He is now engaged in atmospheric research at Bell Laboratories. He married the former Miss Diana Welch in July; she is now working on her own Ph.D. in physics at New York University. Herb reports that **Allen Wirzburger** is a lieutenant in the Navy serving on the carrier *Constellation*. He married his college sweetheart Mary and they are living on the West Coast.

And now for news of classmates received from random sources, including those attending our first reunion last June.

**Michael Coleman** recently received his Army captain's bars in ceremonies at Carlisle Barracks, Pa. Mike also earned his Ph.D. in computer science at Carnegie-Mellon University. He and his wife Patricia reside on the base. . . . **Bob Colomb** is working on his Ph.D. in the social sciences at the University of Missouri in Kansas City; he is also a director of a complete urban information system being developed for that metropolitan area. . . . **Bill Euerle** is working at M.I.T. in the division of sponsored research. His wife Ann is a programmer at Foxboro Corp. . . . **Corey Fair** is at the Courant Institute in New York working on his Ph.D. in mathematics. He and his wife Ellen have two children with a third on the way. . . . **Edward Graham** recently received his Ph.D. from Carnegie Tech. . . . **John Graham** received his M.D. from the University of Minnesota in 1968. He is now on the staff of Friends Hospital in Philadelphia; his wife plans to take a course in photography at the Philadelphia College of Art.

**Huber Graham** received his Ph.D. in EE at M.I.T. this past June, and is now a stockholder and vice president of Computek, a firm building graphic display terminals. . . . **Bob Grant** is working for Arthur D. Little, Inc. as a management consultant for electric companies, after receiving his M.S. in EE from M.I.T. and

his M.B.A. from Harvard. His wife, Sally, teaches the third grade in Newton and they are the owners of a new home in Concord. . . . **Allen Harano** is working at the M.I.T. Instrumentation Laboratories on the Apollo program. . . . **Fred Luconi** is a part-time assistant professor of EE at M.I.T., after receiving his Ph.D. in 1968. The rest of his time is devoted to Index Systems, Inc., a new company founded by himself, **Jerry Burnett**, and **Dick Carpenter**. He and his wife Suzanne have a one-year-old daughter Christina. . . . **Dave Morrison** is working for General Electric in Pittsfield on process control metallurgy. He is also pursuing his Ph.D. in polymer science and running a one-man wholesale tire business on the side. And this does not count the work involved in raising a litter of English setters. So if your car has a flat in Pittsfield and you need a dog to guard the vehicle, just call you-know-who.

**Ken Olshansky** is practicing law in Boston after receiving his LLB (recently changed to a J.D.) from Harvard Law School. . . . **Robert Popadic** has been promoted to assistant vice president of the State Street Bank and Trust Co. of Boston. Bob is assigned to the computer services division. . . . **Jim Rome** is working on his Ph.D. in EE at M.I.T. He has a patent application pending for a high voltage switch for triggering capacitor banks in nanoseconds. . . . **Kim Sloat** has moved about in the past five years as a field secretary for Delta Upsilon, a student at Fuller Theological Seminary, and a student at U.C.L.A. Business School. He is now in a Ph.D. program in clinical psychology at U.C.L.A. and is enjoying it very much; he also works in the data processing division at Hughes Aircraft. Kim was married last February. **William Wallace** is working for MITRE in applied mathematics after receiving his M.S. in EE from M.I.T. That's the news for this month. Let me hear from you.—**Ron Gilman**, Secretary, 5209 Peg Lane, Memphis, Tenn. 38117

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By the time you read this, you will have received the first publicity blurb from the reunion committee. Buried in the fine print is a plea for five bucks of your hard-

earned cash. Please don't bristle too much at these dues. It's the first since we've been out and we need the money for deposits and reunion expenses. We've got about \$250 in the treasury now, but it's far short of the amount needed. So if you haven't sent the check already, please do!

**Carol Van Aken** and **Steve Lipner** were on the young alumni seminar committee. The seminar, on starting and operating small businesses, was held at M.I.T. in early October. . . . **Manmohan Khanna** co-authored with Professor Edgerton, '27, an article on high speed nature photography which appeared in the July issue of the *IEEE Spectrum*. . . . **John Holzer** has been promoted to product manager by Digital Equipment Corporation. He is now in charge of their new solid state machine controller.

**Richard Nathan** received his Ph.D. in organic chemistry from Brooklyn Polytech and is now working for Polaroid's Chemical Development Department in Cambridge. . . . **Pat Connor** graduated from the Harvard Business School last June as a Baker Scholar. . . . Captain **Fred Doyle** just finished a tour of duty at Bien Hoa AFB, Vietnam. . . . **Bill Freed** has joined Celanese Plastics Company in Clark, N.J. as a research engineer.—**Jim Wolf**, Secretary, Brigham Road, Gates Mills, Ohio 44040

## 66

This month the postman must have lost his way because I have received only a few letters. Fortunately, by way of some well-placed phone calls, I did acquire news of some class members. But you'll have to agree that twenty-cent letters are cheaper than long distance phone calls.

In the mail bag were notices about three classmates in the service. **William J. Maselunas**, Course XV, has gone through basic training at Lackland AFB and is now in accounting and finance training at Sheppard AFB, Texas. Before entering the Air Force, he obtained an M.B.A. at Columbia Business School. . . . Second Lieutenant **Donald B. Hansen**, Course XVI, has been assigned to Webb AFB, Texas, for pilot training after graduation



from O.T.S. at Lackland AFB. After leaving M.I.T. he went to Stanford for his master's. His wife, the former Sharon Witkauckas, is from Rialto, Calif. . . . First Lieutenant **Grinnell Jones, 3d**, has entered the Air Force Institute of Technology at Wright-Patterson AFB, Ohio, to study for a master's in aerospace mechanical engineering. He was commissioned at M.I.T. upon completion of R.O.T.C. and was previously assigned at Hill AFB, Utah.

So much for the mail bag. Now for the phone calls. Class President, **Bill Byrn**, Course XV, and **John Freeman** both work for the Assistant Secretary-Controller in the Office of the Secretary of Defense. . . . **Gene Sherman** is interning at the University of North Carolina's hospital; his wife has just begun her medical studies there. . . . **Pete Kirkwood**, Course XVI, left Hughes Aircraft to work for a small consulting firm; he and Jim Reid, '68, share housing in Manhattan Beach, Calif. . . . **Dick Nygren**, Course III, is still at Northwestern and hopes to finish his Ph.D. in metallurgy this year. . . . **Bob Macdonald**, Course VI, left Western Reserve Medical School to go to Virginia. He and his wife, Cathy, bought a house in Charlottesville where he is continuing his medical studies.

**Dave Penny**, Course II, worked this summer running a road repairing crew for his uncle in Pittsburgh, Kansas. He will receive his master's from Dallas Theological Seminary this coming June. **Bob O'Donnell**, Course XVI, stayed at M.I.T. for his S.M. while working part-time for the Instrumentation Laboratory. He is now in Austin at the University of Texas with his recently acquired wife, Ann, and hopes to receive his Ph.D. this June.

We didn't have room to report the following last month:

**John Hoffmeister** (III) is doing operations research for the Vertol Division of Boeing outside of Philadelphia. He works for another M.I.T. aeronautical engineer. . . . **Enrique Garcia-Corona** is presently Planning Manager at Quimica General, S.A., an affiliate of Celanese Corp., in Mexico. . . . Among those who attended Alumni Day, 1969, were Mr. and Mrs. **Panos Spiliakos**; he is now Assistant Secretary of M.I.T.'s Alumni Association. . . . **Tom Van Tienhoven** is still single (!) and back in the U.S. after 12 months in the Argentine Army. He is handling construction management for Bechtel International's chain of overseas hotels. . . . **George Berbeco** (X) has been named assistant to the president of Moleculon Research Corp., Cambridge. His new responsibilities include planning and controlling marketing and new business efforts. He will continue as an advisor to the polymer department where he was previously a research engineer.

**Ira Davidoff** is presently a 4th year student at Harvard Medical School. He spent last summer in India investigating the structure of their health care system and

the family planning program as well as evaluating the effectiveness of India's attempts to upgrade the health status of its population. . . . This year's appointments to M.I.T.'s faculty found at least two of our number on the list. **George Boolos** (XXI) is to become Assistant Professor of Philosophy in Humanities, and **Neil Todreas** (XXII) is to be Assistant Professor in Nuclear Engineering. I guess they now have a chance to dish back some of what they received. . . . After living in Woodstock, Vt., while John worked for and received his Ph.D. from Dartmouth, Carolyn and **John Unger** have moved to Menlo Park, Calif. There John will be working for the National Center for Earthquake Research.

**Martin Kaliski** (VI) obtained an S.M. in Course VI and an S.B. in Course XVIII during 1968 while an N.S.F. Graduate Fellow. During that time he worked at the N.A.S.A.'s Electronics Research Center at Cambridge and at M.I.T.'s Electronic Systems Lab. In April he published a paper about on-line computer simulation in the *I.E.E.E. Transactions on Computers*.

**Pat Winston** (S.M. XVI) published a paper on a class of orbits in the earth-moon field in November, 1968, while also working at N.A.S.A.'s Electronics Research Center. . . . **Daniel Babitch** published "A Systems Analysis of the Cesium Beam Atomic Clock" in the June, 1968, *I.E.E.E. Transactions*. . . . **Stu Madnick** is working for S.M. degrees in E.E. and management. His primary interest is in industrial management; Stu has published "Script, An On-line Manuscript Processing System" in the August, 1968, *I.E.E.E. Transactions*. . . . **Wai-Tak Lee** published in the September, 1968, *I.E.E.E. Transactions* the paper—"An Exchange-Coupled Thin-Film Memory Device." . . . A picture of **Dennis Overbye** appeared in the November, 1968, *Sky and Telescope* in connection with Edgerton, Germeshausen & Grier, Inc., photographic equipment used to record the Siberian total eclipse.

That's it for this month. Hope the postman doesn't get lost again next month. Cheers.—**Terry Vander Werff**, Secretary, 24 Horwood Close, Oxford, England OX3 7RF

## 67

As a hint I'll begin this month's news with my address: Jim Swanson, Services Provinciaux, Beni-Mellal, Morocco. How about a letter or post card?

### A few take the fatal plunge

**Jan Carlson** writes that in June of 1968 he married the former Miss Carolyn Blood of Boston University School of Nursing. He's now working for the Electronic's Research Center of N.A.S.A. . . . **N. Allen Gammon** married Miss Julia Nichols of Gainesville, Florida, on August 3, 1968. Also in August of 1968 he began work at the U.S. Naval Ship Missile Systems Engineering Station, Port Hueneme, Calif. . . . **Dr. Moshe Meiselman** married the former Rioka Leah

Eichenstein December 22, 1968. He wrote that he was planning to be an assistant professor at City College of New York if it opened.

### . . . But one survives

Fortunate **Gary Powell** writes: "I'm not doing a heck of a lot. I have put in two years with General Electric, one in Binghamton, N.Y., and one in Philadelphia. I am being transferred to Pittsfield (of all places) this month where I will undoubtedly learn to ski. This past year I somehow survived a bout with the temptation of marriage and subsequent headaches, and I'm hoping that I will be good for some time. Greetings to all former N.R.S.A. bridge players!"

**Thomas Wilson** is president of High Performance Plastics, makers of kayaks, canoes, and industrial fiber reinforced plastics. He's busy establishing the business. . . . **Bob** and **Carol Hooker**, both '67ers, are still at Purdue, where Carol has a Purdue fellowship and Bob has an N.S.F. fellowship and still spends his spare time chasing trains. . . . At last notice **Larry Greenburg** was working on his Ph.D. in physics at Berkeley. His wife Joan presented him with a daughter, Cindy, Feb. 5, 1969. . . . **Firouz Esfandiari**, after receiving his degree in architecture, had an internship for two years with the Boston firm of Halasz & Halasz. He is planning to return to Teheran to set up his own architectural practice. . . . In September **Roy Lindorf** started in a Stanford University Ph.D. program in engineering—economic systems.

**John Hespenheide** is among the enlisted ranks in the U.S. Army, having been drafted in October, 1968. He's stationed at West Point, working at the Office of Research as a programmer. He announces an addition to the family, Amy Lynn, born May 5, 1969. . . . **Larry Aronberg**, having received his M.S. in management in June and having been accepted in to Harvard Business School doctoral program, was drafted. At last notice he was to be inducted in July. . . . **Jim Bayley** is in South Vietnam, having enlisted in the U.S. Army in October, 1968. On June 29, 1968, he married the former Molly Gilbert (Wellesley '67) of Spokane, Washington. . . . **Dave Garbin** has been commissioned a second lieutenant in the U.S. Air Force upon graduation from Officer Training School at Lackland AFB, Texas. He has been assigned to Keesler AFB, Miss., to attend a ground electronics course. . . . In January, **Fred Orthlieb** was assigned to Coast Guard Headquarters, Washington, having been commissioned an ensign. He's working for Office of Research & Development in pollution control. . . . **John Rible** wrote that he never went to Honeywell, as was reported, but that he decided to work for a one-man data-processing business while living in his bus in the LA area. While there, he spent most of his time doing volunteer work: LA Free Clinic (on board of directors); Pacific State Hospital for the retarded; and a Summerhill type school, teaching 6.14 to ten- and eleven-year-olds. On

March 19, however, he was drafted. After basic training he went to Fort Bliss, Texas, and followed an electronics technician apprentice program. He writes: "I am very much against the army; beads aren't approved. Peace and love. Would love to hear from people." . . . **Jim Cronburg** is still in the Air Force working on various human factors projects at their simulation facility. He and his wife are directing a youth choir and have also started a small group of popular singers. In May he wrote that his wife, who at that time was a junior at Wright State University, was about to present him with a child. Also, they were planning to move to Yellow Springs in the fall to be near Antioch College.

**John Jamieson** is an electrical engineer in the Launch Vehicle Operations Branch of N.A.S.A.'s Kennedy Space Center. Personnel of the branch were responsible for preparing the Saturn V rocket that launched the Apollo 11 spacecraft. . . . Donald and **Lucy Hodges** are in the Peace Corps in Beja, Tunisia. Don is an architect, and Lucy is a health counselor. . . . Last year **Mark Hodes** was in a Ph.D. program in philosophy of science at Stanford. . . . **Bill Murray**, having worked at Lincoln Lab for a year, has resumed his studies leading to a Ph.D. in physics at the University of California at Santa Barbara. . . . **Jerry Tomanek**, after receiving his M.S. in electrical engineering from Stanford, is in New York City with Mobil Oil's International Management Development Program. . . . **Don Weldon**, having received an M.S. in mechanical engineering from Purdue, is working for General Electric's Aircraft Engine Group in Lynn, Mass., on compressor design.—**Jim Swanson**, Secretary, Services Provinciaux, Beni-Mellal, Morocco.

## 68

As usual I shall start the column this month with wedding news, then military news. Activity in both these areas appears to have reached a temporary lull. I hope part of this means people are having better luck with the draft, but I don't know how to interpret the other.

We only have two weddings to report this month. **Al Singer** married Dinah Schiffer, '69 in September. Al is a second-year student at Columbia Medical School. **John Nardello** was married to Kristine Berg in August. He works for the Missile and Space Systems Division of McDonnell-Douglas and Kristine is a recent graduate of the University of Wisconsin in Milwaukee.

**John McFarren** graduated from O.T.S. and was commissioned a 2nd Lieutenant in the Air Force. He is now at Mather AFB, Calif., for navigator training. . . . 2nd Lieutenant **Bob Mitchell** has enlisted in the Air Force and is stationed at Lowry A.F.B., Colorado.

**Peter Nagata** received an M.S. in metallurgy and materials science from Carnegie along with **Ahmad Houshmand** who

received an M.S. in EE. . . . **Robert Anthonyson** is continuing at Stanford working for an M.B.A. . . . **Ken Marko** is still working on a Ph.D. and writes, "Am currently infirmly happy after having failed my Army physical, with a bit of luck I'll be I-Y for quite sometime." . . . **Richard Odessey** is studying in the physiology department, Division of Medical Science, at Harvard. . . . **Mike Krashinsky** is now at Yale studying towards a Ph.D. in economics after spending last year teaching at Loyola College and taking two English courses at McGill. At Loyola he taught two freshman engineering courses and assisted in a third year course. . . . **Dick Koolish** spent the summer working at M.I.T. and hopes to work on the new Educational Survey Committee.

**John Moore** spent last year studying genetics at the University of North Carolina and has now entered the Medical School there. . . . From Berkeley, **Jeff Reece** writes that the tear gas and fanatic California politics sometimes makes him nostalgic for Cambridge soot and smog and Massachusetts political corruption. . . . **Paul Modrich** is a graduate student in biochemistry at Stanford and his wife Ann is working as a chemistry technician at Syntex Laboratories. . . . **Richard Henderson** spent the summer at the First National City Bank in New York and now plans to finish an S.M. in management at the Sloan School in June 1970. He is on the Graduate Student Council Executive Committee as treasurer.

In the oil industry is **Walt Eldredge** who works for Humble Oil and Refining Co. and is involved in control of water pollution by hydrocarbon and phenolic by-products and in computer controlled blending techniques for jet fuel, motor gasoline, and aviation gasoline. . . . Having left Cape Kennedy last Spring, **Roger Fox** now writes that he is "unwillingly producing weapons of mass destruction." . . . **Al Currano** reports that he finished two quarters towards an M.S.E.E. at Berkeley and is now working at the Johns Hopkins Applied Physics Laboratory on Navy defense research; he hopes to finish his master's by June. At Berkeley he worked in the same lab as Steve Haas and Dave Mechler. . . . **Jerrold Sabbath** is working for N.A.S.A.-ERC at Tech Square and is slowly pursuing an M.S. in EE at M.I.T.

And now a few notes about people who received graduate degrees with our class. **Mary Photias Zak** spent the year as an assistant professor of biology at Chamberlayne Junior College in Boston. On June 9 the Zak's first child was born—boy named Mieczyslaw Janusz. . . . **Robert Bergeron** spent last year as instructor in the M.I.T. mathematics department before joining Bell Laboratories in June. . . . **Christopher Moore** has joined New England Nuclear Corporation as a research product specialist for the Washington, D.C., N.I.H. area. . . . **Martin Maltz** is working for Xerox, Rochester, in display technology. The proposed S.D.S.

merger pleases him as he is gravitating towards computer display. . . . **Lenore Blum** is a lecturer in mathematics at Berkeley. . . . **Frank Massa, Jr.** has been appointed by Dynamics Corporation of America as vice president of its Massa Division in Hingham. . . . **Robert Homsy** is presently working for a Ph.D. in chemical engineering at Berkeley and is "fighting vigorously to stay one step ahead of the inevitable 'blue meanie' draft." . . . Having spent a year at Rhode Island Junior College in Providence teaching economics, **Richard Butler** has returned to the Institute to resume work on a Ph.D. in that subject. . . . **Roger Barker** has returned to England to work for Shell Research Ltd. at the Thornton Research Centre in Chester. . . . Together with people from Harvard, Cornell, Princeton, Chicago, and other schools, **Alan Paller** has formed a corporation called Computer Consultants International, Inc., which has the mission of applying computers quickly and directly to urban problems which lend themselves to applications such as employment, court processing, and transportation. . . . **Robert Weinraub** is working on VTOL/VSTOL aircraft in the Advanced Design Section of the Naval Air Systems Command in Washington, D.C.

**Gary Ender** has been with the Peace Corps in Nepal since September 1968 and has another 9 months to go there. He has been teaching agriculture and would appreciate hearing from classmates about how things are going on this side of the world. I can imagine that he doesn't get too much mail in Kathmandu. His address is: Gary Ender, Peace Corps, c/o American Embassy, Kathmandu, Nepal. Airmail is suggested for obvious reasons.

That's all we have for this month. Thanks for all the notes you've sent and let's try to keep those cards and letters coming folks!—**Gail and Mike Marcus**, Secretaries, Eastgate Apt. 16A, 60 Wadsworth St., Cambridge, Mass. 02142

## late news

NOTE: The following was submitted by the Secretary of '12.

We regret to report that our assistant secretary, **Jay Pratt**, was stricken in October with a mild heart attack from which he was satisfactorily recovering at last report. He is, of course, confined to his home, which will probably preclude his usual winter sojourn in Acapulco. He is still hoping, however, that this trip may be possible. I am certain that he will be most pleased to receive letters from classmates during his convalescence.



## SIXTH ANNUAL TOUR PROGRAM—1970

This unique program of tours is offered to alumni of Harvard, Yale, Princeton and M.I.T. and their families. The tours are based on special reduced air fares which offer savings of hundreds of dollars on air travel. The tour to India, for example, is based on a special fare, available only to groups and only in conjunction with a tour, which is almost \$400 less than the regular air fare. Special rates have also been obtained from hotels and sightseeing companies. Air travel is on regularly scheduled jet flights of major airlines.

The tour program covers four areas where those who might otherwise prefer to travel independently will find it advantageous to travel with a group. The itineraries have been carefully constructed to combine the freedom of individual travel with the convenience and saving of group travel. There is an avoidance of regimentation and an emphasis on leisure time, while a comprehensive program of sightseeing ensures a visit to all major points of interest. Hotel reservations are made as much as a year and a half in advance to ensure the finest in accommodations.

Preliminary information concerning the 1970 tour program is presented below. Definitive information and tour brochures will be available shortly.

## THE ORIENT

30 DAYS \$1649

1970 will mark the sixth consecutive year of operation for this fine tour, which offers the true highlights of the Orient at a sensible and realistic pace. As a special attraction, spring and summer departures will include a visit to the "EXPO 70" World's Fair in Osaka. Twelve days will be spent in JAPAN, divided between TOKYO, the FUJI-HAKONE NATIONAL PARK, and the ancient "classical" city of KYOTO, with excursions to NARA and NIKKO. A further highlight will be a comprehensive visit to the famous ruins of ANGKOR WAT in Cambodia, together with visits of 4 to 5 days in BANGKOK and HONG KONG and a shorter visit to SINGAPORE. Optional pre and post tour stops may be made in HONOLULU and the WEST COAST at no additional air fare. A complete program of sightseeing will include all major points of interest. Features range from a tour of the canals and floating markets of Bangkok and an authentic Javanese "Rijsttafel" dinner in Singapore to a launch tour of Hong Kong Harbor at sunset and a trip on the ultra-modern 125 mph express trains of Japan. Most tour dates include outstanding seasonal attractions in Japan, such as the spring cherry blossoms and beautiful autumn leaves and some of the greatest annual festivals in the Far East. Total cost is \$1649 from California, \$1819 from Chicago, \$1887 from New York. Special rates from other cities. Departures in March, April, June, July, September and October, 1970.



## INDIA

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An unusual opportunity to see the diverse and fascinating subcontinent of India, together with the once-forbidden kingdom of Nepal and the rarely-seen splendors of ancient Persia. Here is India from the mighty Himalayas to the palm-fringed Bay of Bengal: the great seaport of BOMBAY; the magnificent cave temples of AJANTA and ELLORA, whose thousand year old frescoes are among the outstanding achievements of Indian art; the unique "lake city" of UDAIPUR; the walled "pink city" of JAIPUR with an elephant ride at Amber Fort; AGRA, with the Taj Mahal and other celebrated monuments of the Moghul period such as the Agra Fort and the fabulous deserted city of Fatehpur Sikri; the holy city of BANARAS on the sacred river Ganges; the industrial city of CALCUTTA; a thrilling flight into the Himalayas to KATHMANDU, capital of NEPAL, where ancient palaces and temples abound in a land still relatively untouched by modern civilization; the great capital of NEW DELHI; and the fabled beauty of the VALE OF KASHMIR amid the snow-clad Himalayas. PERSIA (Iran) includes the great 5th century B.C. capital of Darius and Xerxes at PERSEPOLIS; the fabled Persian Renaissance city of ISFAHAN with its 16th century palaces, gardens, bazaar, and famous tiled mosques; and TEHERAN. Outstanding accommodations include hotels that once were palaces of Maharajas and luxurious houseboats on Dal Lake in Kashmir. Total cost is \$1699 from New York. Departures in February, August and October, 1970.

## AEGEAN ADVENTURE

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This original itinerary explores in depth the magnificent scenic, cultural and historic attractions of Greece, the Aegean, and Asia Minor—not only the major cities but also the less accessible sites of ancient cities which have figured so prominently in the history of western civilization, complemented by a luxurious cruise to the beautiful islands of the Aegean Sea. Rarely has such an exciting collection of names and places been assembled in a single itinerary—the classical city of ATHENS; the Byzantine and Ottoman splendor of ISTANBUL; the citadel of Agamemnon at MYCENAE; the ruins of ancient TROY, the sanctuary and stadium at OLYMPIA where the Olympic Games were first begun, the beginnings of western civilization at CRETE, the ruins of

SARDIS in Lydia where the royal mint of the wealthy Croesus has recently been unearthed; centers of the Ionian League such as MILETUS and PRIENE; the magnificent marble city of EPHEBUS; crusader castles at RHODES and other sites; beautiful Aegean islands such as DELOS, MYKONOS, PATMOS and HYDRA, as well as CORINTH, EPI-DAUROS, DELPHI, PERGAMUM, DIDYMA, IZMIR (Smyrna), the BOS-PORUS and the DARDENELLES. Total cost is \$1299 from New York. Departure in April, May, July, August, and September 1970.

## EAST AFRICA

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A luxury "safari" to the great national parks and game reserves of Uganda, Kenya and Tanzania. These offer a unique combination of magnificent wildlife and breathtaking natural scenery: great herds of elephants in QUEEN ELIZABETH PARK, in the shadow of the fabled "Mountains of the Moon"; a launch trip on the White Nile through hippo and crocodile to the base of the thundering MURCHISON FALLS; multitudes of lion and other plains game in the famous SERENGETI PLAINS and the MASAI-MARA RESERVE; the spectacular concentration of animal life in the NGORONGORO CRATER; tree-climbing lions around the shores of LAKE MANYARA; and the AMBOSELI RESERVE, where all types of big game can be photographed against the towering backdrop of snow-clad Mt. Kilimanjaro. Air travel is used where possible, enabling longer stays within the parks. Also seen are the fascinating capital cities of KAMPALA, NAIROBI and DAR ES SALAAM, the exotic "spice island" of ZANZIBAR, and the historic MOMBASA, a beach resort on the Indian Ocean, with its colorful Arab quarter and great 16th century Portuguese fort. Tour dates have been chosen for dry seasons, when game viewing is at its best. The altitude of most areas provides an unusually stimulating climate, with bright days and crisp evenings (frequently around a campfire). Accommodations range from luxury hotels in modern cities to surprisingly comfortable lodges in the national parks (some equipped even with swimming pools). Total cost from New York is \$1649. Departures in July and September, 1970.

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injustice; also, an unfair act.

*IN-ER-RAN-CY* (-ēr'-un-sī) *noun* The state of being free from error; as applied to Scripture, plenary inspiration.

*IN-ER-RANT* (-ēr'-unt) *adj.* Exempt from error; unerring.

*IN-ERT* (-ürt') *adj.* 1 Destitute of inherent power to move; possessing inertia; inactive. 2 Sluggish. 3 Devoid of active chemical properties; as, the *inert* gases; neutral. See synonyms under HEAVY, IDLE, LIFELESS, PASSIVE, SLOW. [*<L. iners <in-, not, + ars, art*] — *IN-ERT-LY* *adv.* — *IN-ERT-NESS* *noun* — *IN-ER-TION* *noun*.

*INERT GASES* Helium, neon, argon, krypton, xenon, and radon.

*IN-ER-TIA* (-ēr'-ti-ā) *noun* 1 The property of a body by which it resists any change in its state of motion or rest. 2 The property of a body by which it resists any change in its state of motion or rest.

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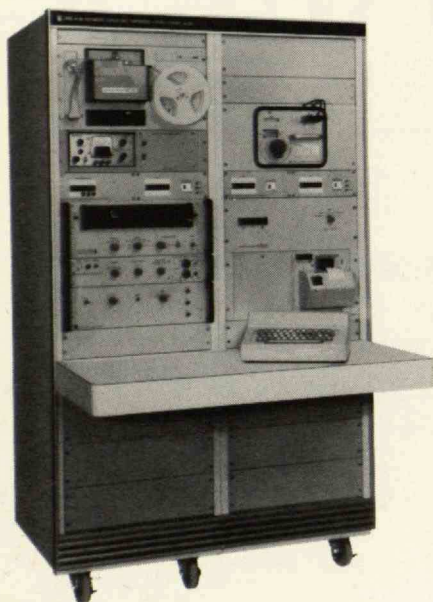
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